OLYMPUS

DELTA Family Handheld XRF Analyzer

User Interface Guide

International edition

103202-01EN — Revision A

December 2012

Olympus NDT, 48 Woerd Avenue, Waltham, MA 02453, USA

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This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

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List of Abbreviations

ACEA	Advisory Committee on Environmental Aspects
IEC	International Electro-technical Commission
LOD	limit of detection
MN	match number
ND	non-detect
OS	operating system
PD	packaging directive
PMI	positive materials identification
RoHS	Restriction of Hazardous Substances
SDD	silicon drift detector
UI	user interface
WEEE	Waste Electrical and Electronic Equipment

Important Information — Please Read Before Use

Intended Use

The DELTA family of handheld XRF analyzers is designed to perform identification and analysis of elements contained within test samples, from magnesium to uranium (Mg to U), depending on the selected model.

CAUTION

Do not use the DELTA for any purpose other than its intended use.

Instruction Manual

This instruction manual contains essential information on how to use this Olympus product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

Safety Symbols

The following safety symbols might appear on the instrument and in the instruction manual:

General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.

High voltage warning symbol

This symbol is used to alert the user to potential electric shock hazards greater than 1000 volts. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

Safety Signal Words

The following safety symbols might appear in the documentation of the instrument:

DANGER

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.

WARNING

The WARNING signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in death or serious personal injury. Do not proceed beyond a WARNING signal word until the indicated conditions are fully understood and met.

CAUTION

The CAUTION signal word indicates a potentially hazardous situation. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a CAUTION signal word until the indicated conditions are fully understood and met.

Note Signal Words

The following safety symbols could appear in the documentation of the instrument:

IMPORTANT

The IMPORTANT signal word calls attention to a note that provides important information, or information essential to the completion of a task.

NOTE

The NOTE signal word calls attention to an operating procedure, practice, or the like, which requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The TIP signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or provides hints on how to effectively use the capabilities of the product.

Warranty Information

Olympus guarantees your Olympus product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the *Olympus NDT Terms and Conditions* available at http://www.olympus-ims.com/en/terms/.

The Olympus warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Olympus for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Olympus product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Olympus makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Olympus reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

Technical Support

Olympus is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page at: http://www.olympus-ims.com.

1. Home Screen and System Setup

1.1 Home Screen

The DELTA user interface (UI) is centered around the **Home** screen. It displays four buttons (**Mode**, **Test**, **Results**, **Setup**) which control access for managing the entire Olympus DELTA XRF application (see Figure 1-1 on page 5).

Figure 1-1 Home screen

Table 1 Home screen button descriptions

Button	Name	Description
	Mode	Opens the mode screen, where you can select and configure available modes. See the individual mode chapters for more information.
	Test	Opens the **Test** screen, where you can perform a Cal Check, modify test parameters, and run tests. See chapter 7 on page 81 for more information.
	Results	Opens the **Results** screen, where you can view and analyze test results. See chapter 8 on page 91 for more information.

Table 1 Home screen button descriptions *(continued)*

Button	Name	Description
	Setup	Opens the **Setup** screen, where you can configure system-wide setup options. See section 1.2 on page 6 for more information.

1.2 System Setup

System-wide setup functions are accessed from the **Setup** screen (see Figure 1-2 on page 6).

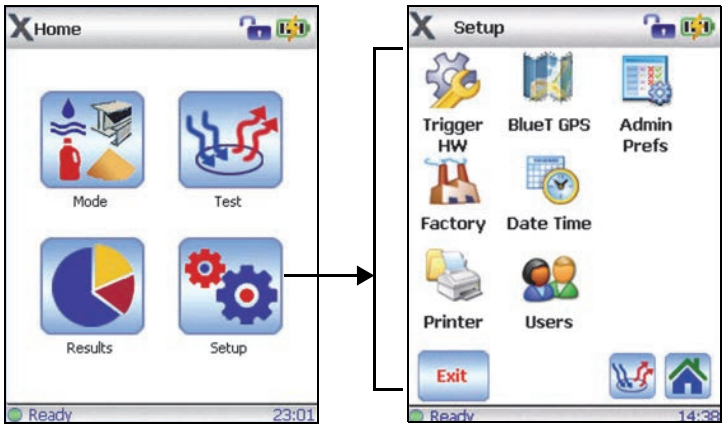


Figure 1-2 Home *(left)* and Setup *(right)* screens

Functions available in the Setup screen

Table 2 Available Functions

Button	Name	Description
	Trigger HW	*Trigger hardware*. Determines trigger settings and displays status screens.
	Blue T GPS	*Bluetooth® GPS*. Acquires location data through a Bluetooth enabled GPS device.
	Admin Prefs	*Administrative preferences*. Enables or disables selected features of the analyzer.
	Factory	*Factory settings*. System settings set at the time of manufacture — these cannot be altered by the user.
	Date Time	Sets the date and time using the calendar and clock.

Table 2 Available Functions *(continued)*

	Printer	Connects the analyzer to selected Bluetooth enabled printers.
	Users	Applies administrator and operator user privileges.
	Exit	Restart or shut down the analyzer.

1.3 Trigger Hardware

The Trigger HW (trigger hardware) function allows you to access information and configuration screens.

To view the Safety/Hardware screen

1. In the **Setup** screen, tap **Trigger HW** ( ) to display the **Safety/Hardware** screen (see Figure 1-3 on page 7).

Figure 1-3 Safety/Hardware screen

1.3.1 Viewing the hardware status

This option displays information about the state of the DELTA hardware.

To view hardware status information

1. In the **Safety/Hardware** screen, tap **Hardware Status** (see Figure 1-3 on page 7) to view the current status of the analyzer hardware (see Figure 1-4 on page 8).
2. To see all items, tap and drag the vertical and horizontal scroll bars.
3. To view a list of logged events that have occurred on the analyzer, tap **Log**.
4. Tap **Back** to return to the **Setup** screen.

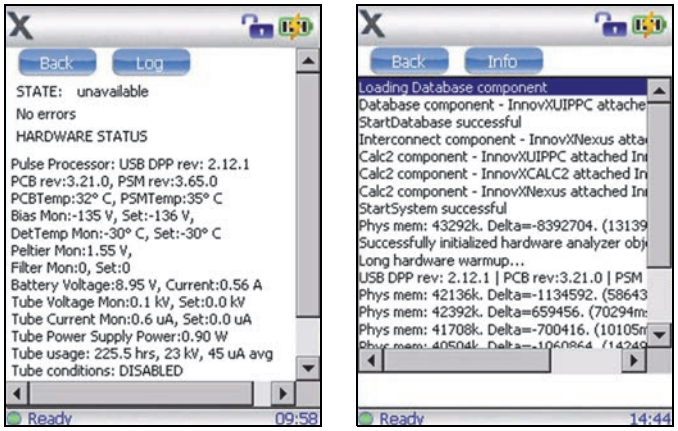


Figure 1-4 Hardware status screens

1.3.2 Working with trigger settings

The trigger settings determine how the analyzer behaves when the trigger is pressed. There are two available settings:

- Deadman trigger

  When the deadman trigger function is enabled, the DELTA trigger must be held for the duration of a test. This ensures that the analyzer is attended at all times while X-rays are emitted.

  When the deadman trigger function is disabled, pulling the trigger once starts a test, pulling it again stops the test.

  A test can also be controlled from the **Test** screen by tapping the Start Test and Stop Test buttons to toggle the X-rays on and off.
- Trigger lock

  Trigger lock is a safety feature that disables the trigger after a set idle time.

IMPORTANT

Canadian regulations require using the deadman trigger at all times.

To select trigger settings

1. In the **Safety/Hardware** screen (see Figure 1-3 on page 7), tap **Trigger Settings** to display the password screen (see Figure 1-5 on page 9).
2. Tap in the **Password** box, and then enter the password using the **Input Panel** (see Figure 1-5 on page 9).

   Default password is **z** (lower case).
3. Tap **OK** to display the **Trigger Settings** screen (see Figure 1-5 on page 9).

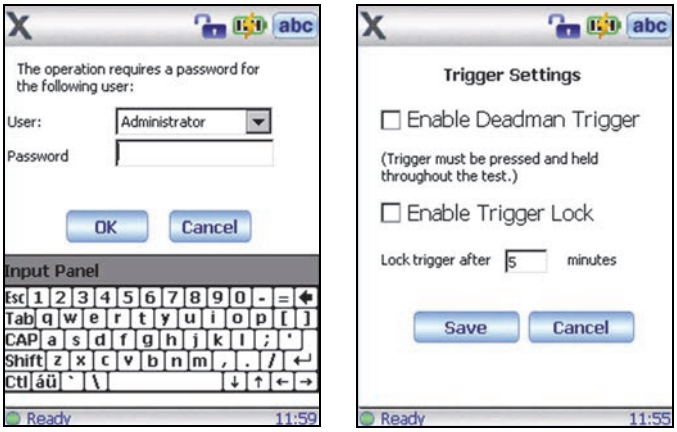


Figure 1-5 Password screen with Input Panel *(left)* and Trigger Settings screen *(right)*

To enable the deadman trigger

- In the **Trigger Settings** screen, **s**elect **Enable Deadman Trigger**.

To enable the trigger lock timeout

1. In the **Trigger Settings** screen, select **Enable Trigger Lock** (see Figure 1-5 on page 9).
2. Tap in the **Lock trigger after *n* minutes** box, and then enter a value (see Figure 1-6 on page 9).

Figure 1-6 Trigger Settings screen

3. Tap **OK**, and then tap **Save** to save your settings and return to the **Safety/Hardware** screen.
4. Tap **Back** to return to the **Setup** screen.

To lock and unlock the trigger during operation

Tap the Lock button (when it appears in the screen header) to lock and unlock the analyzer trigger during normal operation (see Figure 1-7 on page 10).

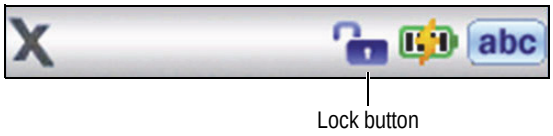


Figure 1-7 Screen header

IMPORTANT

Canadian regulations require using the deadman trigger at all times.

1.3.3 Changing the barometer settings

The barometer provides air density information to correct the XRF readings. The barometer is set at the factory, however, barometer settings may be changed in the **Barometer Settings** screen.

To change the barometer settings

1. In the **Safety/Hardware** screen, tap **Barometer** to display the **Barometer Settings** screen (see Figure 1-8 on page 10).

   The current reading in millibars is displayed at the top of the screen.
2. To change the **Minimum** and **Maximum** values:
   - Tap on the boxes and enter a value

     OR

     Tap **Set Range +/– 50** to set the minimum and maximum values to within 50 millibars of the current reading.

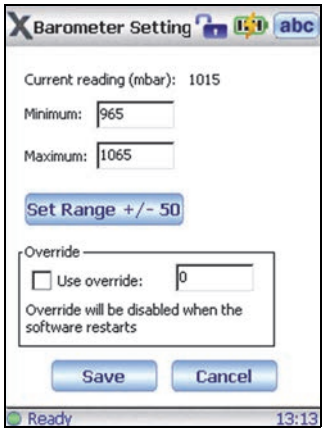


Figure 1-8 Barometer Settings screen

3. To override the current barometer setting, select **Use override**, and then enter a value.

   The override setting is disabled when you restart the analyzer software.
4. Tap **Save** to save your changes and return to the **Safety/Hardware** screen.

1.3.4 Viewing the Error Log

To view the error log information

1. In the **Safety/Hardware** screen (see Figure 1-3 on page 7), tap **Error Log** to view a list of logged events that have occurred on the analyzer (see Figure 1-9 on page 11).
2. To see all items, tap and drag the vertical and horizontal scroll bars.
3. To view the current status of the analyzer hardware, tap **Info**.
4. Tap **Back** to return to the **Setup** screen.

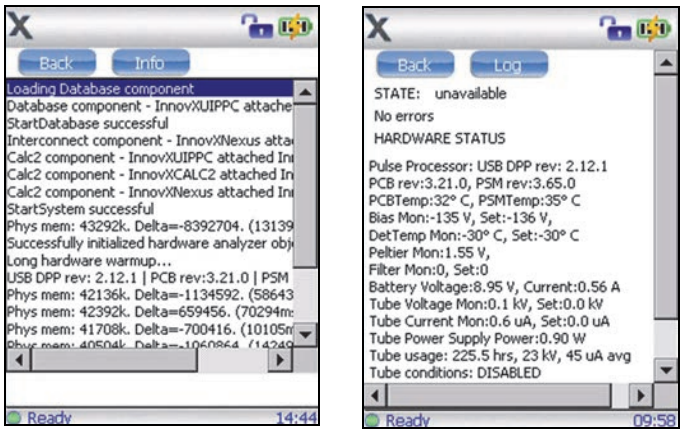


Figure 1-9 Error log screens

1.3.5 Setting the Regulatory Level

When 50 kV monitoring is enabled, you can set the maximum annual dose limit so that warnings are displayed when that limit is approached and reached. You can also view the **Regulatory Level** screen to track the annual totals.

To set the regulatory level

1. In the **Safety/Hardware** screen, tap **Regulatory Level** (see Figure 1-3 on page 7) to display the password screen.
2. Tap in the **Password** box, and then enter the password using the **Input Panel**.
   Default password is **z** (lower case).
3. Tap **OK** to display the **Regulatory Level** screen (see Figure 1-10 on page 12).
4. Enter a value for maximum annual regulatory dose.
5. Tap **Save**.

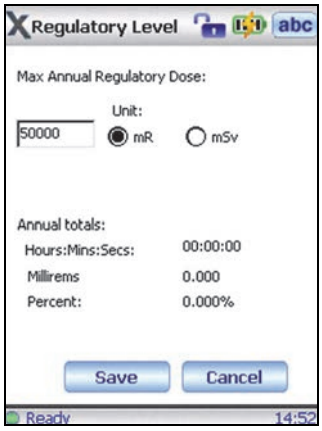


Figure 1-10 Regulatory Level screen

1.4 Bluetooth GPS

The Bluetooth® GPS function allows you to acquire GPS location data through a Bluetooth enabled GPS device.

To configure the Bluetooth GPS function on the DELTA analyzer

1. Ensure that you have the Bluetooth device turned on.
2. In the **Setup** screen, tap **BlueT GPS** ( ) to display the Bluetooth GPS screen (see Figure 1-11 on page 12).
3. Select the **Enable GPS** check box.
4. Tap **Query** to begin the search for a compatible Bluetooth enabled device.
   The **Query** button turns gray during the search. It changes back to blue when the search is finished.
5. In the **Bluetooth GPS** list, select a device.

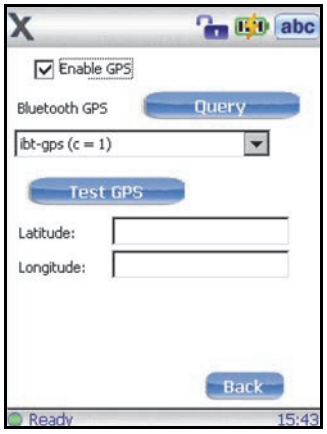


Figure 1-11 Bluetooth GPS screen

6. Tap **Test GPS** to test the selected device.

When the test is completed, the local latitude and longitude values are updated (see Figure 1-12 on page 13).

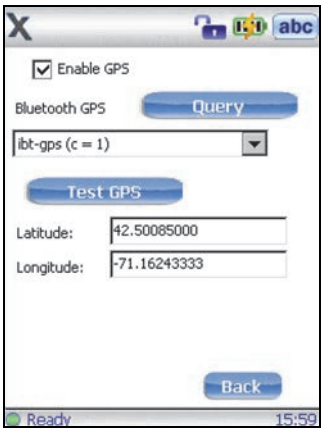


Figure 1-12 Bluetooth GPS screen — GPS test completed

1.5 Admin Prefs

The Admin Prefs function allows you to enable or disable selected features of the DELTA analyzer.

To setup the Admin Prefs function

1. In the **Setup** screen (see Figure 1-2 on page 6), tap **Admin Prefs** ( ) to display the administrative preferences screen (see Figure 1-13 on page 14).
2. To enable AU karating in Alloy mode, select **AU Karating**.
3. To enable test label editing, select **Test Label Edit**.
4. To display the QWERTY keyboard for data entry, select **Default to QWERTY Keyboard For Text**.

   Otherwise, a numeric keypad displays (see the example in Figure 1-6 on page 9).
5. To enable live averaging, select **Live averaging**.
6. To enable historical averaging in test results, select **Historical averaging**.

Figure 1-13 Admin Prefs screen

7. Select one of the **Pre-Test Edit Options**:
   - **Off**
   - **Optional**
   - **Force**
8. Select a **Date Format**:
   - **U.S.**
   - **European**
9. Tap **Back** to return to the **Setup** screen.

1.6 Factory Settings

The functionality behind the **Factory** (factory settings) button ( ) is set at the time of manufacture and is not available to users.

1.7 Date and Time

Setup date and time using the calendar and clock.

To change the date or time

1. In the **Setup** screen, tap **Date Time** ( ) to display the **Set Date and Time** screen (see Figure 1-14 on page 15).

Figure 1-14 Set Date and Time screen

2. Tap the left and right arrows on the upper bar to move to the proper month and year.
3. Tap the desired date.
4. Tap the up/down arrows to set the time**.**
5. Tap **OK**.

1.8 Printer

The DELTA analyzer is configured to print to selected Bluetooth® enabled printers. The primary purpose of the Printer function is to enable pairing between the DELTA analyzer and a printer. The print output also can be customized for each analyzer mode.

When the printer is enabled, a **Print** button is displayed or activated on relevant **Results** screens.

To pair the DELTA analyzer with a Bluetooth enabled printer

1. Ensure that your printer is turned **On**.
2. In the **Setup** screen, tap **Printer** ( ) to display the printer screen (see Figure 1-15 on page 16).
3. Select the **Enable Printer** check box.
   When the printer is enabled, a **Print** button is displayed on relevant **Results** screens.
4. Select options as required:
   - To print test results as soon tests are completed, select the **Automatic Printing** check box. No operator intervention is required.
   - If you are using labels with the printer, select the **Label Form Feed** check box.
5. Tap **Query** to search for available Bluetooth enabled printers.
   The **Query** button turns from blue to gray during the search; it returns to blue when the search is completed.
6. In the **Printer Type** list, select a printer type (the DELTA currently only works with Zebra printers).
7. In the **BT Printer** list, select a printer serial number.

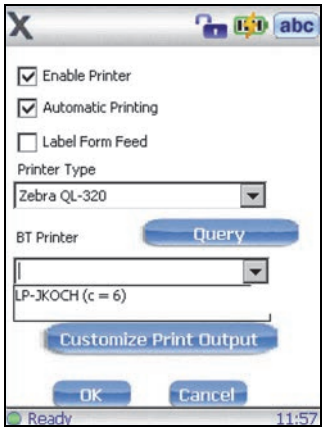


Figure 1-15 Printer screen

To customize the print output for the current mode

1. Before customizing the printer output, make sure the analyzer is set to the mode you want to customize.
2. Tap **Customize Print Output** to display the initial **Printout Settings** screen for the current mode set on the analyzer (see Figure 1-16 on page 16).
3. Scroll up and down and select items, and then create a list of fields to be printed using the left and right arrows (/).
   - To change the order of items in the list, use the up/down arrows (/) under the Printed area.
   - To move all items from one list to the other, use the **All** buttons.

NOTE

Fields 7 and 8 should be reserved for GPS data when using a Bluetooth GPS device.

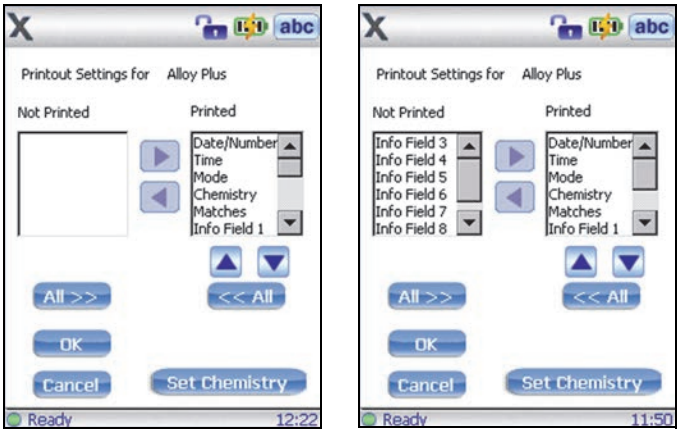


Figure 1-16 Print Settings screens — Select print fields

4. Tap **Set Chemistry** to display the next **Printout Settings** screen (see Figure 1-17 on page 17).
5. Scroll up and down and select items, then create a list of elements to print using the left and right arrows:
   - To change the order of items in the list, use the up/down arrows under the **Printed** area.
   - To move all items from one list to the other, use the **All** buttons.
6. To print by descending order of concentration, select the **Order by Value** check box.
7. To print the entire element suite of the selected mode, select the **Show All** check box.

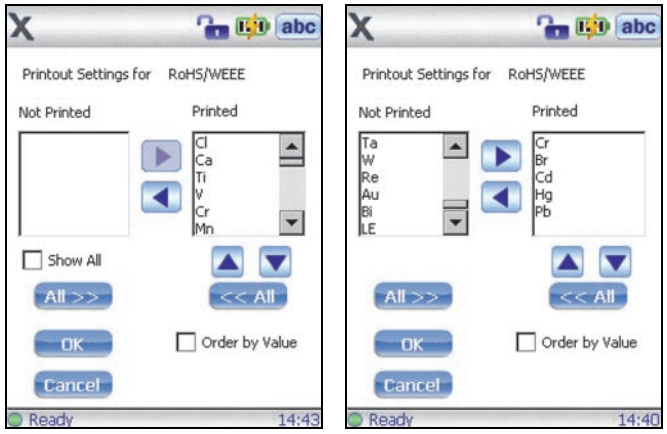


Figure 1-17 Print Settings screens — Select print fields *(continued)*

8. Tap **OK** to save your changes and return to the previous **Print Settings** screen.
9. Tap **OK** again to return to the printer screen.
10. Tap **OK** a final time to save changes, exit the Print function, and return to the **Setup** screen.

1.9 Users

Applying user (administrator and operator) privileges permits supervisory management to maintain control over sorting activities.

- Administrators can set (and modify):
  - Trigger hardware options
  - Mode test conditions
  - Display parameters
  - Library Manager functions.
- Operators can view most options and parameters, but cannot make changes.

To set user privileges

1. In the **Setup** screen, tap **Users** ( ) to display the users screen (see Figure 1-18 on page 18).

2. In the **Administrator** area, tap in the **Password** box, and then enter the administrator password.
3. Tap in the **Verify** box, and then enter the password again.
4. In the **Operator** area, tap in the **Password** box, and then enter the operator password.
5. Tap in the **Verify** box, and then enter the password again.
6. When completed, tap the Display Keyboard button (**abc**) to close the **Input Panel**.
7. Tap **Save** to save your changes and return to the **Setup** screen.

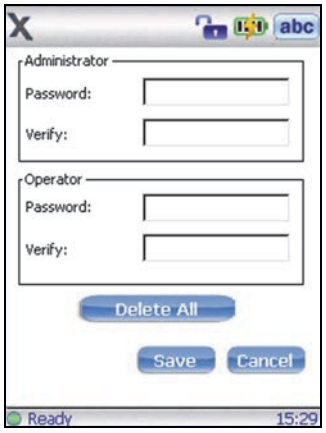


Figure 1-18 Users screen

1.10 Exit

1. In the **Setup** screen, tap **Exit** to display the exit screen (see Figure 1-19 on page 18).

Figure 1-19 Exit screen

The exit screen displays three options (see Table 3 on page 19).

Table 3 Exit screen options

	Restart the operating system (OS) and restart the analyzer software.
	Restart the analyzer software.
	Shuts the system software down and powers the analyzer off (confirmation required).

2. Alloy, Alloy Plus, and Precious Metals Modes

Alloy, Alloy Plus, and Precious Metals modes are similar in operation, though the end-user objectives are different, and the modes use a different number of X-ray beams. Alloy Plus mode uses two beams, and its second beam is able to detect lighter elements such as magnesium (Mg) and aluminum (Al). Alloy mode also uses two beams, though its second beam is used to improve precision on titanium (Ti) and vanadium (V) measurement. Precious Metals mode uses one beam.

Mode setup involves setting test conditions such as **Test Setup**, **End Time Type**, and various **Alloy Options**. Settings are accessed using the **Test Conditions** screen.

2.1 About Alloy Analysis Modes

When the DELTA analyzer is in an alloy analysis mode, it calculates elemental chemistry from the spectral data. The analyzer then compares chemical composition values to Factory Grade library grade tables, and generates grade ID and chemistry values in as little as one second.

The Precious Metals mode includes a Plate Alert feature that alerts you to the possibility that the object being analyzed is gold-plated. Plate Alert works by analyzing spectra to determine whether or not the object has a thin coating or plating of gold. If the analysis is affirmative, the message, “Gold Coating Possible - Investigate” is displayed with the test results. Also, if a gold content is detected, but measures less than 8 karat, the plate alert message is displayed. Absence of the Plate Alert warning means that there is not enough information to conclude if the sample has a gold coating or is solid.

2.2 Test Setup

The **Test Setup** screen allows you configure test parameters such as test time and test repeat.

To configure test setup

1. Select the appropriate mode, and then tap **Mode Setup**.
2. From the **Mode Setup** screen, tap **Test Conditions** (see Figure 2-1 on page 22).

Figure 2-1 Mode Setup screen

3. From the **Test Conditions** screen (see Figure 2-2 on page 22), tap the Test/Tools button ( ).

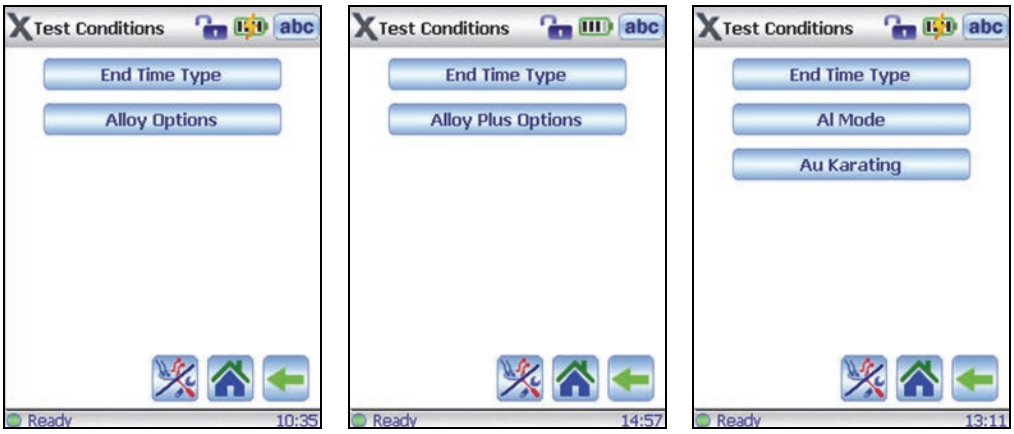


Figure 2-2 Alloy Test Conditions screen variations

In the **Beams** area, only one beam is available in Alloy and Precious Metals modes, while two beams are available in Alloy Plus mode.

4. In the **Test Setup** screen, enter minimum and maximum test times for each beam (see Figure 2-3 on page 23).
   - **Min** is the minimum testing time before test results are actually calculated and displayed. This value can be set to zero.
   - **Max** is the total length of time a test runs. If the time is configured too short, the test can fail or imprecisely calculate results.
5. Enter additional variables as needed (see Figure 2-3 on page 23), including:
   - The number of times you want to repeat the test.
   - Whether to display a confirmation message before each test.
   - Whether to generate an average of all tests in a test set.

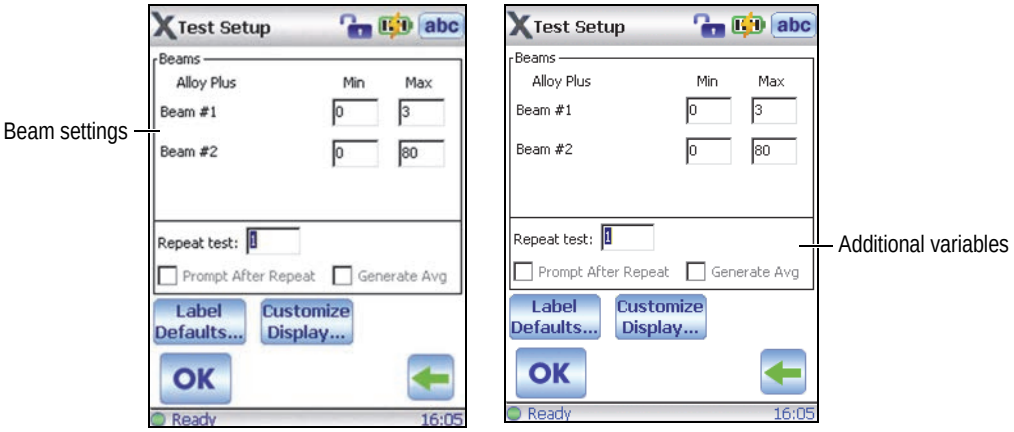


Figure 2-3 Test Setup screens — Beam settings and additional variables

NOTE

If the **Generate Avg** check box is selected, spectrum results (plots) are NOT available for the average result.

6. Tap **OK** to save your changes and return to the **Test Conditions** screen.

2.3 End Time Type

You can control how test end time is calculated using the **End Time Type** parameter.

To change the end time type:

1. From the **Test Condition** screen, tap **End Time Type** to display the **End Time Type** screen (see Figure 2-4 on page 24).
2. In the **Test End** area, select the **RealTime** or **LiveTime** check box.
   - **RealTime** is the total interval that the analysis takes when measured on a standard clock. This is the most commonly selected option.
   - **LiveTime** is the interval in which the detector of the analyzer actually collects data. Since the analyzer does not always collect data throughout a measurement, LiveTime is less than the RealTime interval. LiveTime is selected primarily for laboratory calibration applications that require precise and repeatable results.
3. Tap **Save** to save your changes and return to the **Test Conditions** screen.

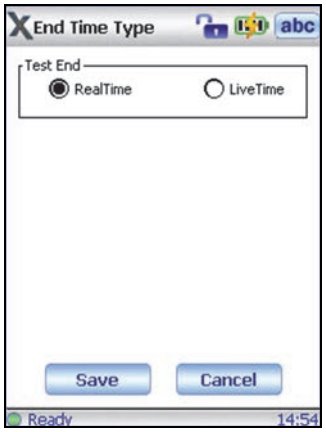


Figure 2-4 End Time Type screen

2.4 Alloy Options

Smart Beam is an option available in Alloy mode. With Smart Beam enabled the analyzer starts testing using standard beam conditions, then, if appropriate, automatically switches to a second beam condition.

To set Alloy mode options

1. In the **Test Conditions** screen, tap **Alloy Options** to display the Smart Beam/Al mode screen.
2. Select an option.

   The Smart Beam options are:

   - **No Smart Beam** — The DELTA will never switch to beam 2. This option is not commonly used.
   - **QuickSort** — If a sample is found to match two alloys, differing only by a small amount of Ti or V, the DELTA switches to a second beam. The second beam is used until the maximum testing time for beam 2 has elapsed. When the DELTA switches to the second beam conditions, the names of the two alloys being separated appear.

     If the alloy has a unique ID or if the best matches differ by something other than a small amount of Ti or V, the analyzer functions as it does with Smart Beam deactivated.
   - **Precision** — The Smart Beam Option screen automatically switches to the second beam condition after the set time for the first beam. The second beam is active for the time specified in the test time screen. At completion, a final result reflecting information from both beam settings appears. This option provides better precision on Ti and V results, if they are present in the alloy.

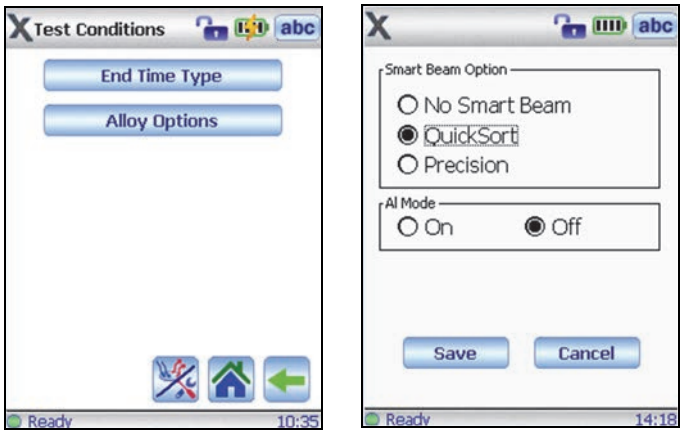


Figure 2-5 Test Conditions *(left)* and Smart Beam Option *(right)* screens

2.5 Alloy Plus Options

The Alloy Plus options are found only when in the Alloy Plus mode. A DELTA analyzer with Alloy Plus mode enabled is a two beam instrument.

About the SmartSort function

The SmartSort function promotes automated sorting decisions that allow you to maximize speed and sorting accuracy. When the SmartSort function is enabled, Alloy Plus will switch to the second beam if it is necessary to provide a conclusive grade match. Some features include:

- Short test times (approximately three seconds) for most grades.
- Specific grades set up to automatically extend testing time for proper analysis.
- Maximum speed testing efficiency by automatically extending test time for light elements (Mg, Al, Si, P, S). This eliminates unnecessary long tests.

To set Alloy Plus mode options

1. From the **Test Conditions** screen, tap **Alloy Plus Options** to display the **Alloy Plus Options** screen (see Figure 2-6 on page 26).
2. Select an option (**SmartSort** is the default).
   - **SmartSort**

     Uses a second beam when needed as determined by the analyzer. Use this option to detect lighter elements (Mg, Al, Si, P, S) without creating unwanted data.
   - **Single Beam - Suppress LE detection**

     This option will test for elements Ti (Atomic Number 22) and higher. It is not possible to match aluminum-base alloy grades with this option. Select this option when using a Weld Mask.
   - **Single Beam - With LE detection**

     This option will test for elements Ti (atomic number 22) and higher. This option detects aluminum (Al) and other light elements indirectly during the beam 1 test and reports them as LE.

- **Two Beams Always (Al, Si, Mg, S, P)**
  Two beam operation is always enabled. Select this option to get information about lighter elements (Mg, Al, Si, P, S). For many grade separations this option generates unwanted excess data.

3. Tap **OK** to save your selection and return to the **Test Conditions** screen.

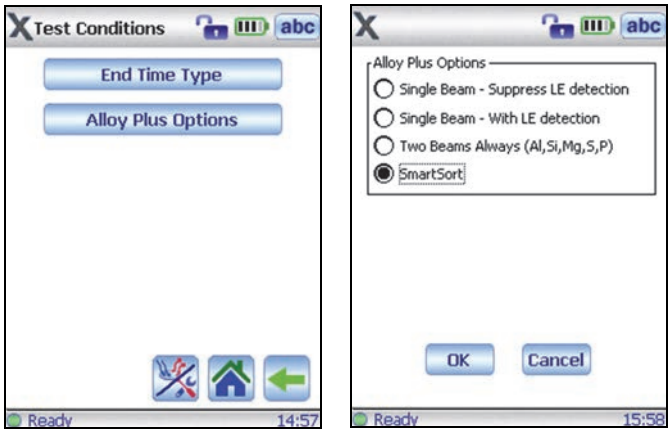


Figure 2-6 Test Conditions *(left)* and Alloy Plus Options *(right)* screens

4. Tap the Back button ( ) to return to the **Mode Setup** screen.

2.6 Al Mode

You can enable Al mode using the **Al Mode** parameter.

NOTE

Al mode toggles LE detection in Alloy mode. Enabling Al mode is similar to using Alloy Plus mode **Single Beam - With LE detection** option (see section 2.5 on page 25). Turn Al mode off when using a weld mask.

To enable Al mode

1. From the **Test Conditions** screen, tap **Al Mode** to display the **Al Mode** screen.
2. Select the **On** option.
3. Tap **OK**.

2.7 Au Karating

You can enable the Au karating function using the **Au Karating** parameter. If detected, gold will be reported in karat value, as well as percent.

To configure Au karating

1. If the Au karating function is enabled, tap **Au Karating** to display the **Au Karating** screen (see Figure 2-7 on page 27).

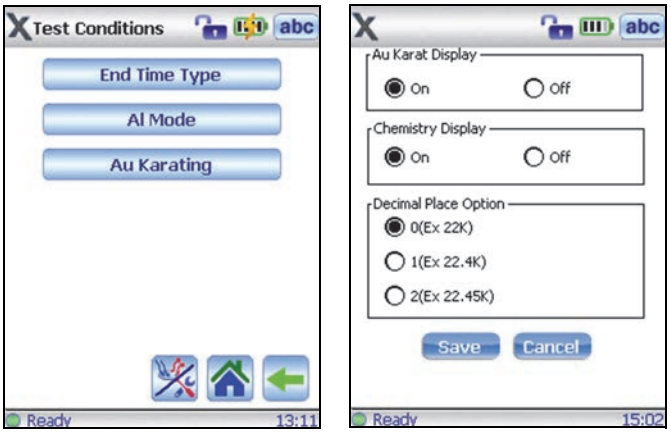


Figure 2-7 AU Karating button *(left)* and AU Karating screen *(right)*

2. In the **Au Karat Display** area, select **On**.
3. In the **Chemistry Display** area, select **On** or **Off**.
4. Make a selection in the **Decimal Place Option** area.
5. Tap **Save**.

2.8 Library Manager

The Library Manager is available only in the Alloy and Alloy Plus modes.

You can edit all libraries, including the Factory Grade library. However, Olympus does not recommend that you edit the Factory Grade library. Instead, Olympus suggests that you copy the Factory Grade library to a user library, then make any edits on the newly created user library.

There are four segments to the Library Manager:

- **Match Settings**
- **Load Library**
- **Edit Library**
- **Pass-Fail / Select Grade**

To open the Library Manager

- In the **Mode Setup** screen, tap **Library Manager** to display the **Library Manager** screen (see Figure 2-8 on page 28).

Figure 2-8 Mode Setup *(left)* and Library Manager *(right)* screens

2.8.1 Configuring Match Settings

After calculating chemistry, the DELTA compares the chemical composition values to grade tables in a Grade library. The value for a parameter called "match number" is then calculated. The match number indicates how close the measured alloy chemistry is to the library specification. The lower the match number (MN), the better the match:

- MN equalling 0 indicates an **exact** match.
- MN less than 1 indicates a **good** match.
- MN between 1 and 2 is an **okay** match.
- MN between 2 and 3 is a **fair** match.
- MN greater than 3 is a **poor** match.

There are three match determination possibilities provided within the Alloy modes:

- Exact match or good match

  An exact match or good match means that the calculated chemistry for all elements falls within the grade table specifications. A Grade ID is displayed on the **Results** screen. Often other grades are listed with their accompanying match numbers. The elemental chemistries of those grades can be viewed to see how they differ from an exact match.
- Multiple matches

  In some cases, several grades are shown as possible matches. This can signify one of three conditions:
  - — There was not enough statistical information to definitively separate two or more alloys. The actual identification of the unknown alloy is one of the grades listed. Often, increasing the testing time makes it possible to separate the alloys.
  - — There was sufficient statistical information, but the test sample did not meet any of the existing specifications with enough precision to cause an exact match identification.
  - — In rare cases, grade specifications may overlap, meaning that a single sample can meet the specification of two or more alloys. In this case, it is possible to see an exact match to multiple alloys, and increasing test time will not separate the matches.
- No match

  There are several causes for a "no match" result:

— The test sample does not meet any of the specifications in the Grade library.
— The test sample is coated.
— The testing time was too short.
— The match number is too low.

NOTE

See Appendix H on page 141 for information on troubleshooting valid matches.

There may be occasions when valid matches fail to register as exact. This could happen because of measurement uncertainties or the presence of tramp elements. The **Match Settings** screen allows you to change the **Match Cutoff** and **nSigma** parameters in order to correct for measurement uncertainties or the presence of tramp elements.

To configure the match settings

1. In the **Library Manager** screen, tap **Match Settings** to display the **Match Settings** screen (see Figure 2-9 on page 29).
2. In the **Grade Match Parameters** area, tap the up or down arrows (/) to select a **Match Cutoff** value.
3. Tap the up or down arrows (/) to select the **nSigma** value.

   Sorting professionals have suggested a **Match Cutoff** setting of 5, and an **nSigma** setting of 2. The most frequently used **nSigma** setting is between 0 and 2:
   - For scrap sorting, an **nSigma** setting of 0 or 1 is most common.
   - For positive materials identification (PMI) applications, an **nSigma** setting of 1 or 2 is most common.
4. Optionally select any of the following check boxes:
   - **Enable grade match messages** (see section 2.8.3 on page 32 on grade match messages)
   - **Enable grade match POPUP messages**
   - **Enable Beep on grade match**
5. Tap **Save**.

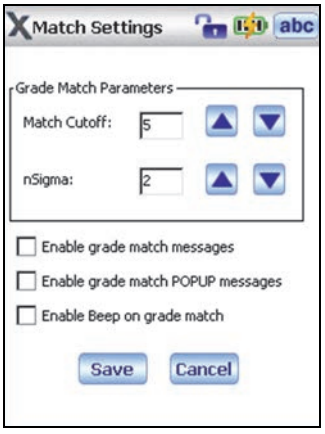


Figure 2-9 Match Settings screen

Calculations using nSigma and Match Cutoff values

The analyzer calculates match settings using the **nSigma** and **Match Cutoff** values.

- **nSigma** —The analyzer collects measurements and the **nSigma** value is used to calculate the amount of tolerable variation, relative to the target value. This approximate range is configured using the min/max values in the Grade library for each element.

  The nSigma parameter factors in the precision of the measurement when matching the measurement against a grade specification:

  — When **nSigma** is set to zero the analyzer ignores the precision of the measurement and uses only the measured value when comparing the measurement to the grade specification in the Grade library.

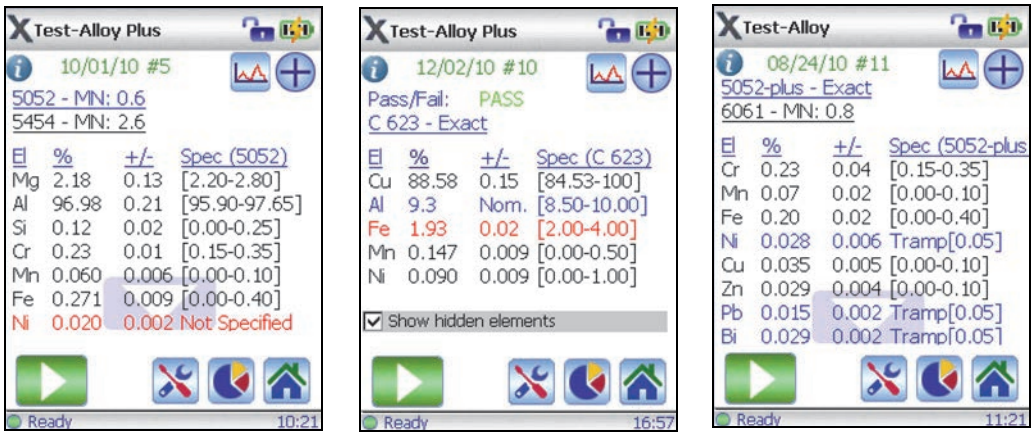
  — A setting of 1, 2, or 3, equates to a factor of 1, 2, or 3 times the precision (±) of each measurement. This occurs when the analyzer is comparing the measurement to the grade specification in the Grade library.
- **Match Cutoff** — Once the measured calculations are analyzed relative to the **nSigma** value, the match number is calculated and compared to the user-configured match number.

Typically, the analyzer searches for exact or nearest matches:

- Exact matches
  — The analyzer calculates chemistries using the Fundamental Parameters algorithm and searches the Grade libraries.
  — All chemistry values must be within a user-definable error band of the min/max values specified in the Grade libraries (see section 2.8.3 on page 32).
- Nearest Matches — When searching for a nearest match the analyzer:
  — Calculates chemistries using the Fundamental Parameters algorithm and searches the Grade libraries
  — Determines which alloy(s) is (are) the closest match to the calculated results
  — Determines whether a grade is considered a match by comparing the calculated match number for that alloy to a cutoff value (typically set at 3).

    The cutoff value supports a wide range of alloys. The cutoff value can be modified, but as a general rule, it should not be changed.

The screens in Figure 2-10 on page 31 are examples of match results after testing (MN = match number).



Good match for 5052
Fair match for 5454
(Aluminum Alloy grades)

Exact match for C623
(Copper Alloy grade)

Exact match for 5052-plus
Good match for 6061
(Aluminum Alloy grades)

Figure 2-10 Screens showing various match conditions

2.8.2 Loading Grade Libraries

The **Load Library** screen allows you to select the libraries that are referenced during testing.

NOTE

For a listing of the Alloy grades contained in the Factory library and Tramp library, see Appendix H on page 141. (Library listings may be incomplete, a grades are continually being added.)

To load the Grade libraries

1. Tap **Library Manager** in the **Mode Setup** screen, then tap **Load Library** (see Figure 2-11 on page 32).
2. In the **Load Grade Libraries** area, select one of the following options:
   - **All** — loads all libraries.
   - **Factory Library Only** — loads only the Factory library (supplied by Olympus).
   - **User-defined** — loads selected libraries, which can include
     - — Factory {model} library (contains over 400 grades). Factory libraries are correlated to the instrument model
     - — Tramp library, (containing seven alloy bases — supplied by Olympus).
     - — Up to two User libraries (each capable of holding over 500 grades)
3. If you select **User-defined**, also select the appropriate checkbox(es).
4. Tap **Save.**

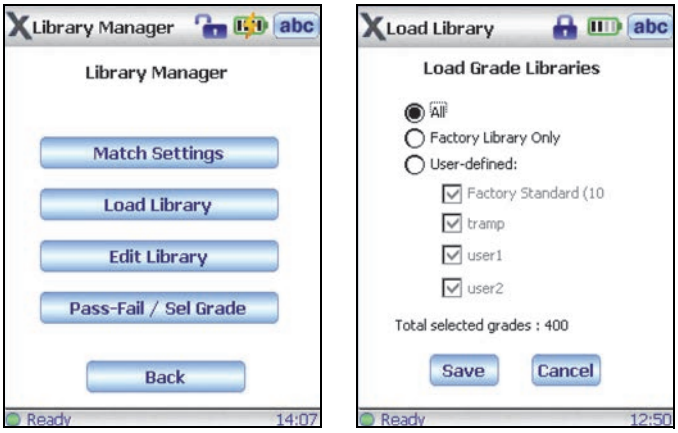


Figure 2-11 Library Manager *(left)* and Load Library *(right)* screens

2.8.3 Editing Grade Libraries

The **Edit Library** screen allows several configuration options that can be applied to DELTA libraries. Grades can be added to any library and existing grades can be edited. Also, the two user-defined libraries can be renamed.

NOTE

You can edit all libraries, including the Factory Grade library. However, Olympus does not recommend that you edit the Factory Grade library.

To select a grade for editing

1. In the **Library Manager** screen, tap **Edit Library** to display the **Edit Library** screen (see Figure 2-12 on page 33).
2. In the **Edit Grade Libraries** area, select a library, and then tap **Edit Existing Grades**.
3. In the **Select Grade** screen (see Figure 2-12 on page 33), use the up/down arrows and scroll bar to locate the grade you want, and then tap the grade to highlight (see Figure 2-12 on page 33).
4. Optionally create a grade match message. Grade match messaging offers:
   - Immediate sorting instructions
   - Less operator training
   - More efficiency and higher throughput.
5. Tap **Select** to save your selection and display the **Min/Max** screen (see Figure 2-13 on page 34).

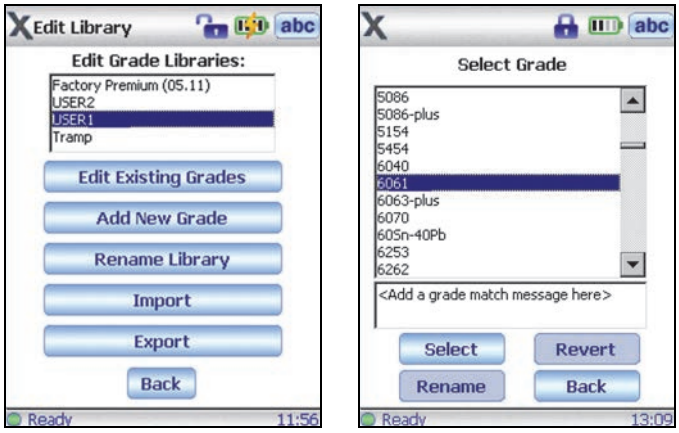


Figure 2-12 Edit Library *(left)* and Select Grade *(right)* screens

The primary purpose of the **Min/Max** screen (see Figure 2-13 on page 34) is to edit existing elements, or add new elements to a grade. You can also:

- Apply the grade parameters to Beam 1, Beam 2 (Beam 2; Alloy Plus mode only), or both beams (Alloy Plus mode only).
- Select the **Smart Grade** check box to maximize speed and sorting accuracy. When you select the **Smart Grade** check box, the current grade is then selected to automatically extend testing time if necessary for proper analysis.

To change existing elements in a grade

1. Tap an **Elements** box to change that element (see Figure 2-13 on page 34).

TIP

When you tap in a box, the **Input Panel** appears. Tap and hold on the gray area to move the **Input Panel** around. To dismiss the panel, tap the Display Keyboard button (**abc**) at the top right corner of the screen.

---

2. Tap the **Min%** or **Max%** box for a given element to change the percentage range of an element within a test sample.
3. To create a new element, tap an empty **Elements** box, and then assign min/max values.

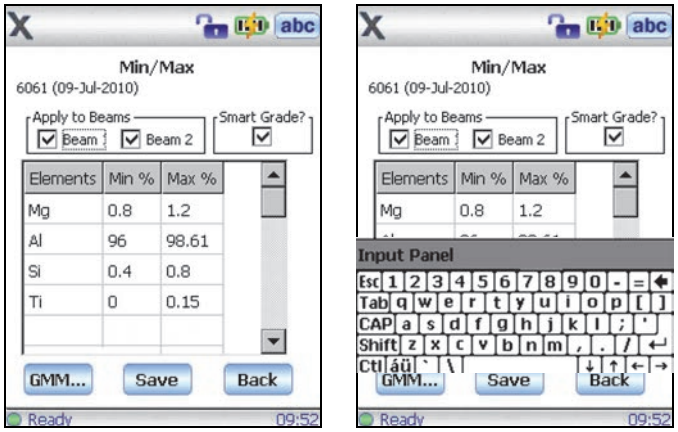


Figure 2-13 Min/Max screen *(left)* and Input Panel *(right)*

To select the options

1. Select one or both of the **Beam** check boxes (see Figure 2-13 on page 34) to designate which beams must run for this grade to be considered as a possible match.
2. Select the **Smart Grade** check box to enable the SmartSort option for this grade.

   If this grade gives an exact match based on the beam 1 test, the SmartSort option is enabled, and the grade is selected as a Smart grade, the analyzer will not switch to beam 2.

To create or edit a grade match message

1. Tap **GMM** (see Figure 2-13 on page 34) to display the grade match message box.

NOTE

This box has the same function as the grade match message box in the **Select Grade** screen (see Figure 2-12 on page 33 *[right]*).

---

2. Edit an existing message or create a new one.

To rename a grade

1. In the **Select Grade** screen, select a grade, and then tap **Rename**.
2. In the **Rename** screen (see Figure 2-14 on page 35), tap in the **Grade Libraries** box, and then enter a new name.
3. Tap **Save** to save your work and return to the **Select Grade** screen.

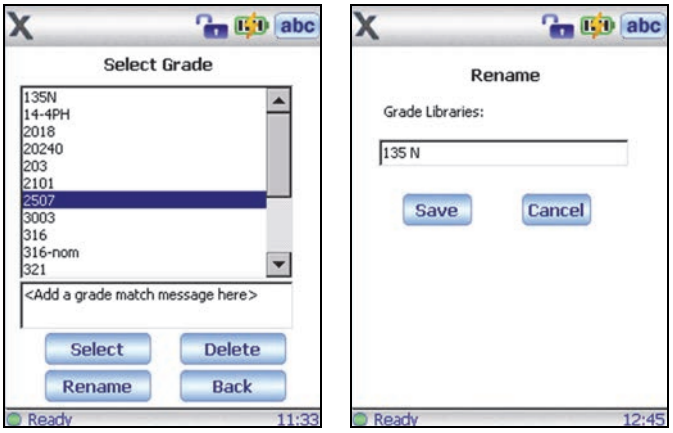


Figure 2-14 Select Grade *(left)* and Rename *(right)* screens

To delete a grade

1. In the **Select Grade** screen, select a grade, and then tap **Delete** (see Figure 2-15 on page 35).
   A dialog box appears prompting you to confirm your selection.
2. Tap **Yes**.

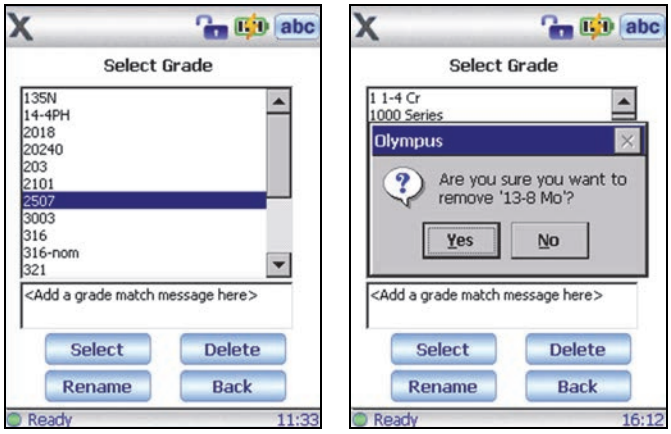


Figure 2-15 Select Grade screen *(left)* and delete dialog box *(right)*

To add a new grade

NOTE
You cannot add a new grade to the Factory Grade library.

1. In the **Edit Library** screen (see Figure 2-16 on page 36), tap **Add New Grade.**
   The **Add Grade** screen appears (see Figure 2-16 on page 36).
2. Tap the **New Grade** box, and then enter the new grade name using the **Input Panel.**

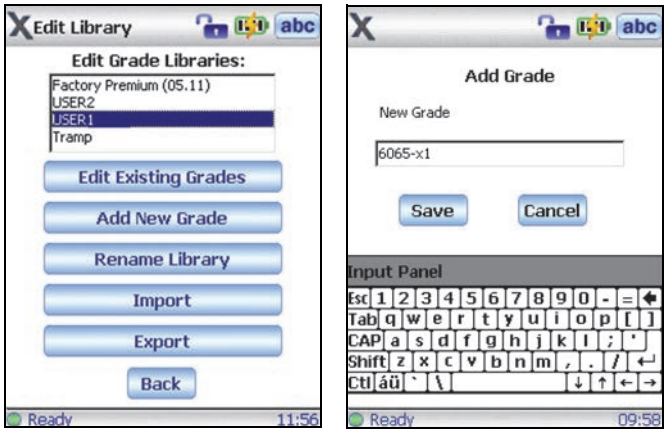


Figure 2-16 Edit Library *(left)* and Add Grade *(right)* screens

3. Tap **Save** to display a **Min/Max** screen with blank boxes (see Figure 2-17 on page 36).

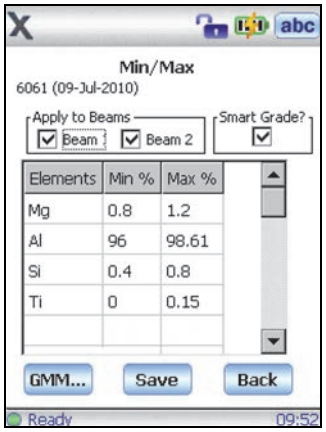


Figure 2-17 Min/Max screen

4. Tap a box, and then enter element symbols and parameter values.
5. To see more empty fields, use the scroll bar.

NOTE

To accurately complete adding a new grade, you must have a list of the minimum and maximum allowable concentrations of each element in the new grade. It is important to include all elements that may be present in an alloy, including balance elements.

To rename an existing library

NOTE

You cannot rename the Factory Grade library.

---

1. From the **Edit Library** screen, tap **Rename Library**.
2. In the **Rename** screen, tap in the **Custom Library** box, and then enter a new library name using the **Input Panel** (see Figure 2-18 on page 37).
3. Tap **Save**.

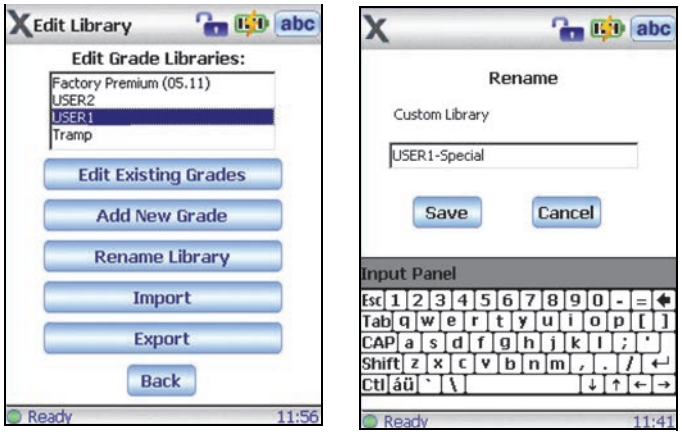


Figure 2-18 Edit Library *(left)* and Rename [library] *(right)* screens

To export a Grade library

NOTE

You can import data into all the libraries, including the Factory Grade library. However, Olympus does not recommend that you change the Factory Grade library.

1. From the **Edit Library** screen, tap **Export** (see Figure 2-19 on page 37).
2. In the **Save As** dialog box, tap the New Folder button to create a new folder in the **My Documents** folder.
3. Use the **Input Panel** to enter the file to be exported.
4. Tap **OK**, and then tap **OK** in the dialog box.

Figure 2-19 Edit Library screen — Export sequence

To import a Grade library

1. In the **Edit Grade Libraries** area of the **Edit Library** screen, select the Grade library that you want to receive the imported grades (see Figure 2-20 on page 38).
2. Tap **Import** to display the **Save As** dialog box.
3. Use the scroll bar to navigate to the file you want to import.
4. Tap the New Folder button to create a new folder.
5. Use the **Input Panel** to enter the name of the file to be imported.
6. Tap **OK** to complete the file import.

Figure 2-20 Edit Library screen — Import sequence

2.8.4 Creating a Pass/Fail Operation

The Pass/Fail feature is designed for high-throughput alloy sorting and quality control. Pass/Fail is one of the most useful features within the Alloy or Alloy Plus modes.

IMPORTANT

In Alloy Plus mode, ensure that SmartSort is selected in Alloy Plus options. For Alloy Mode, ensure that QuickSort is selected in Alloy options.

To create a Pass/Fail operation

1. In the **Library Manager** screen, tap **Pass-Fail / Sel Grade** to display the **Pass/Fail Sel Grade** screen (see Figure 2-21 on page 39).
2. In the **Pass Fail / Select Grade Mode** area, select **Pass/Fail**.
3. Tap **Set Selected Grade** to display the **Edit Library** screen.

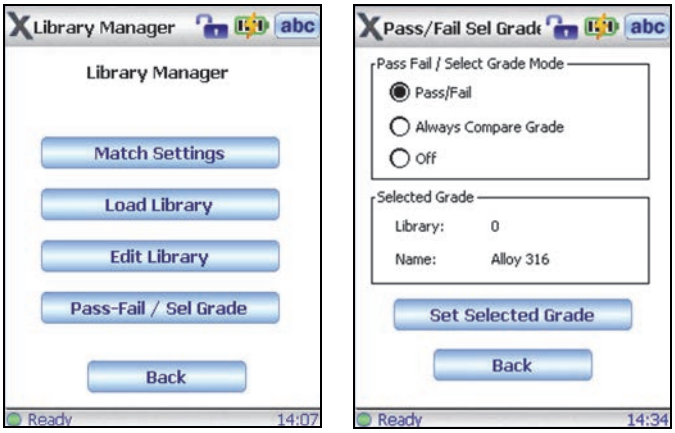


Figure 2-21 Library Manager *(left)* and Pass/Fail Sel Grade *(right)* screens

4. In the **Edit Grade Libraries** area (see Figure 2-22 on page 39), select the library that contains the target alloy grade.
5. Tap **Select Grade** to display the **Select Grade** screen (see Figure 2-22 on page 39).
6. Scroll down to the desired grade, and then tap to select.
7. Tap **Select** to save your selection and return to the **Pass/Fail Sel Grade** screen.

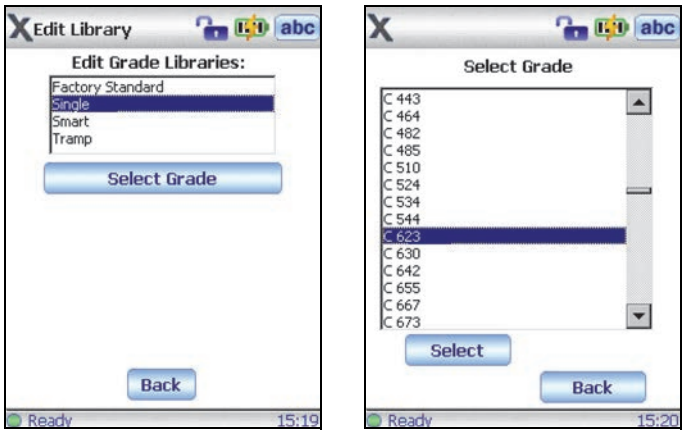


Figure 2-22 Edit Library *(left)* and Select Grade *(right)* screens

8. In the **Pass/Fail Sel Grade** screen (see Figure 2-23 on page 40), tap **Back** to return to the **Library Manager** screen.

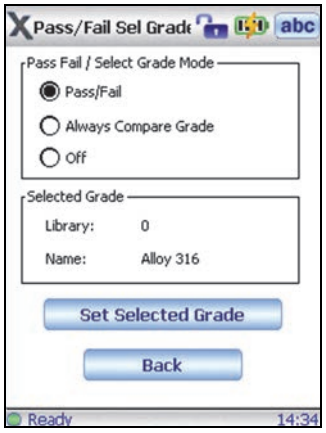


Figure 2-23 Pass/Fail Sel Grade screen

9. In the **Library Manager** screen, tap **Back** to display the **Mode Setup** screen (see Figure 2-24 on page 40).

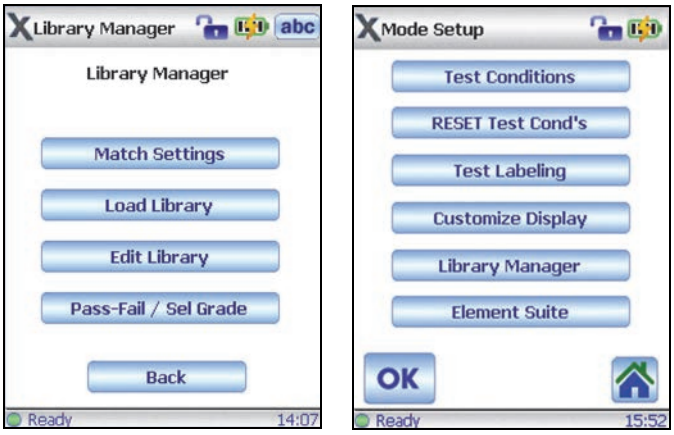


Figure 2-24 Library Manager *(left)* and Mode Setup (right) screens

10. Tap **OK** to display the mode screen (see Figure 2-25 on page 41).
11. Tap the Test button ( ) to display the **Test** screen.
12. Tap the Start Test button ( ) to initiate a test.
    In the example screen (see Figure 2-25 on page 41), the test result for copper alloy C623 is **PASS**.

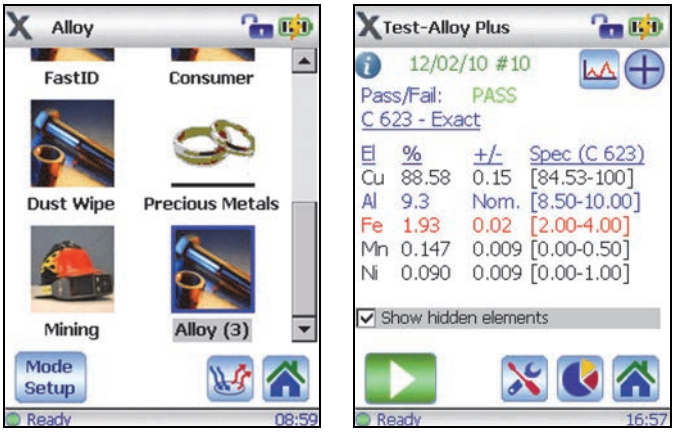


Figure 2-25 Mode *(left)* and Test *(right)* screens — Test result

3. Soil, Mining, and Geochem Modes

Soil, Mining, Mining Plus, and Geochem modes are similar except for the number of beams used in testing. Other differences are noted when applicable.

Mode setup involves setting test conditions such as **Test Setup**, **End Time Type**, **User Factor** and **Packaging Directive**. Settings are accessed using the **Test Conditions** screen.

3.1 Test Setup

the **Test Setup** screen allows you to configure test parameters such as test time and test repeat.

To configure test setup

1. Select the appropriate mode, and then tap **Mode Setup**.
2. From the **Mode Setup** screen, tap **Test Conditions** (see Figure 3-1 on page 43).
3. From the **Test Conditions** screen (see Figure 3-1 on page 43), tap the Test/Tools button ( ).

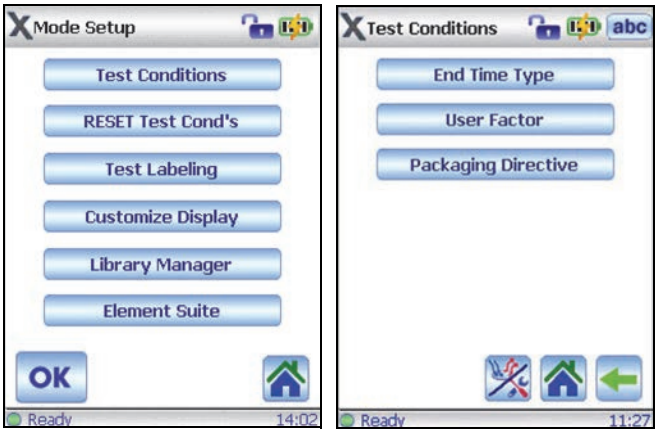


Figure 3-1 Mode Setup *(left)* and Test Conditions *(right)* screens — Soil, Mining, Mining Plus, and Geochem

4. In the **Test Setup** screen, enter minimum and maximum test times for each beam (see Figure 3-2 on page 44).

   The test times you enter depend on the degree of precision required. Typical times for a soil or mining sample range up to 120 seconds. Longer test times may increase precision.

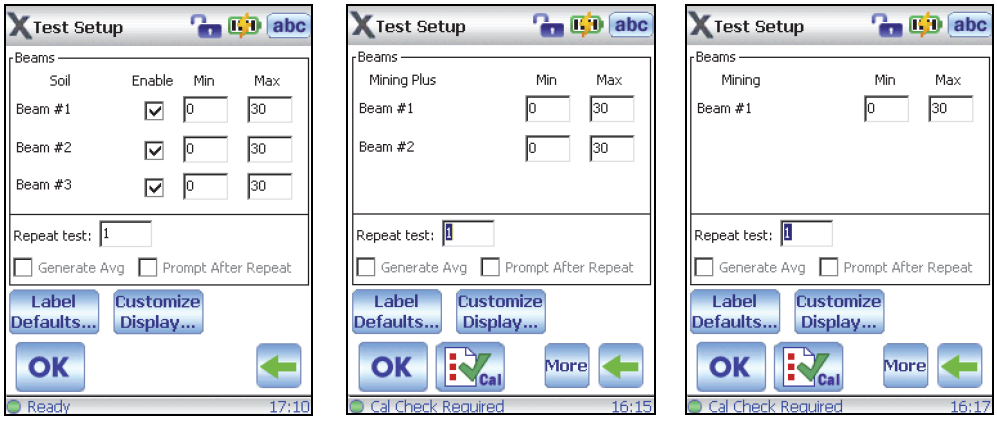


Figure 3-2 Test setup screens (Soil, Mining Plus, and Mining)

5. Enter additional variables as needed (see Figure 3-3 on page 44), including:
   - The number of times you wish to repeat the test.
   - Whether to generate an average of all tests in the test set.
   - Whether to display a confirmation message before each test in a test series.

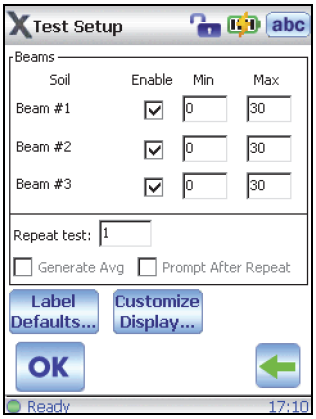


Figure 3-3 Test Setup screen (Soil)

6. Tap **OK** to save your changes and return to the **Test Conditions** screen.

3.2 End Time Type

You can control how test end time is calculated using the **End Time Type** parameter.

To set the End Time Type parameter

1. From the **Test Conditions** screen, tap **End Time Type** (see Figure 3-4 on page 45).
2. To choose how the test end time is calculated, select **RealTime** or **LiveTime**.
   - **RealTime** is the total time that the analysis takes when measured on a standard clock. This is the most commonly selected option.

- **LiveTime** is the actual time during which the analyzer collects data. Since the analyzer does not always collect data throughout a measurement, **LiveTime** is less than **RealTime**. (**LiveTime** is used primarily in laboratory applications where precise and repeatable test times are required).

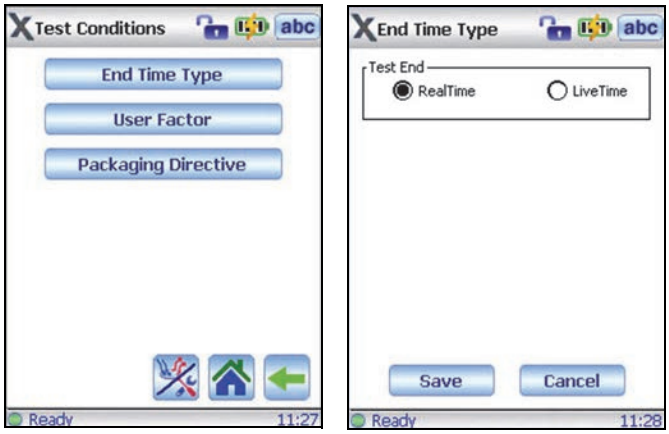


Figure 3-4 End Time Type parameter

3. Tap **Save** to save your changes and return to the **Test Conditions** screen.

3.3 User Factors

Your Olympus DELTA handheld XRF analyzer is optimized at the factory to detect a broad range of elements. You may be able to improve accuracy for your particular elements of interest by creating user factors with custom **Factor** and **Offset** variables. User factors allow you to adjust the results for your particular sample matrix. This is also known as site specific calibration.

You can create multiple user factors and recall them at any time without altering the factory settings. See Appendix E on page 129 for more information.

To set user factors

Before you begin, determine appropriate **Factor** and **Offset** values for your particular elements of interest.

1. From the **Test Conditions** screen, tap **User Factor** (see Figure 3-5 on page 46).
2. On the **User Factors** screen, tap **Create New Model**.
3. Tap **Change Name** to rename the selected model.
4. Using the scroll box, select an element of interest.

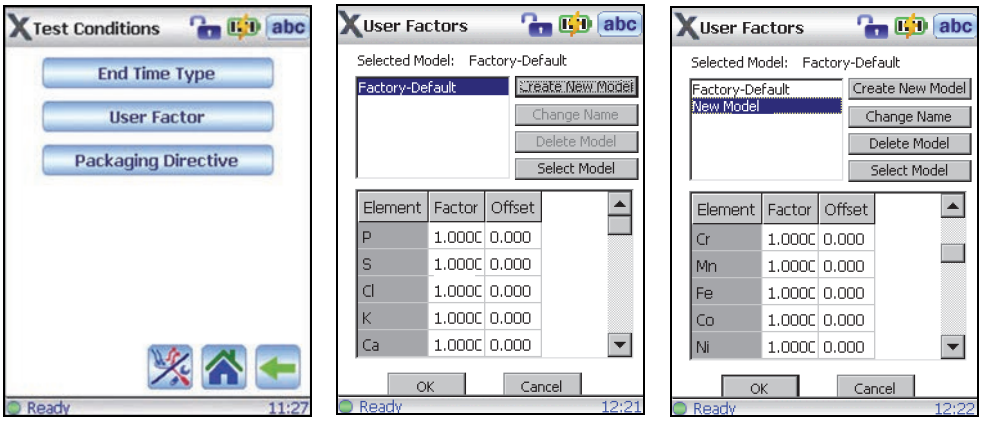


Figure 3-5 User factors (Soil, Mining, Mining Plus, and Geochem)

5. Enter **Factor** and **Offset** values for that element (see Figure 3-6 on page 46).
6. Continue selecting elements and setting factor and offset values for each remaining element of interest.
7. Tap **OK** to save your changes and return to the **Test Conditions** screen.

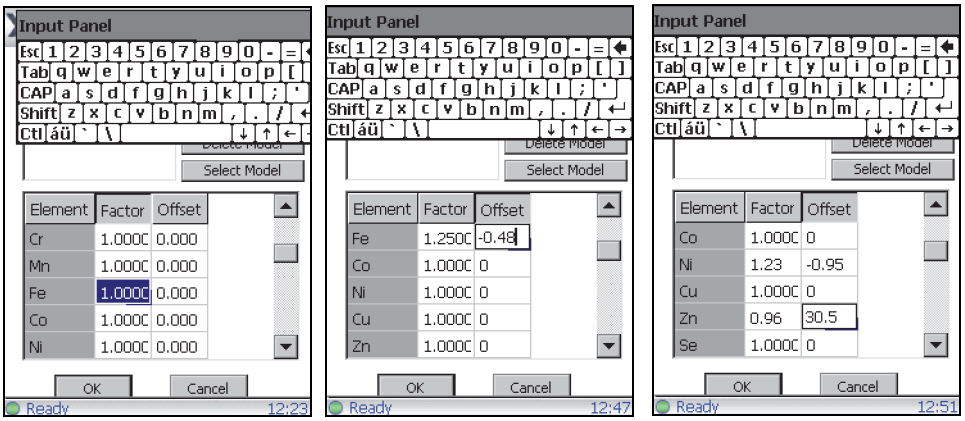


Figure 3-6 Setting user factors (Soil, Mining, Mining Plus, and Geochem)

3.4 Packaging Directive (Optional Configuration)

Packaging Directive (PD) is a factory option available for order on Olympus DELTA handheld XRF analyzers. It provides a method for checking samples for compliance with European Union Packaging Directive regulations. The Packaging Directive requires that combined quantities of Cd, Cr, Hg, and Pb be less than 100 ppm. The sum of these element concentrations is calculated as the “PD value”. When configured, the PD value is displayed on the **Results** screen.

To set Packaging Directive (if configured)

1. From the **Test Conditions** screen, tap **Packaging Directive** (see Figure 3-7 on page 47).
2. Enter **Action Level** (100 ppm by default) and **N Sigma** (3 by default) for the elements of interest.

3. Select **Package Directive Elements** to include or exclude from the element list (Cd, Cr, Hg, and Pb selected by default).
4. Tap **OK** to save your changes and return to the **Test Conditions** screen.

Figure 3-7 Packaging Directive parameter

4. Consumer Safety and RoHS/WEEE Modes

Consumer Safety modes include RoHS/WEEE, Halogen Free, and Consumer Products. The modes are similar except for the number of beams used in testing and major elements of interest. Other differences are noted when applicable.

RoHS/WEEE mode tests polymer, alloy, and mixed samples for RoHS regulated elements Cr, Br, Cd, Hg, and Pb. Halogen Free mode tests plastics and mixed materials for bromine and chlorine content (based on total halogen limit). Consumer Products mode tests polymer, alloy, and mixed items for lead content.

Mode setup for Consumer Safety and RoHS /WEEE modes involve setting test conditions such as **Test Setup**, **End Time Type**, mode settings, **Force Classification**, and **User Factor**. Settings are accessed using the **Test Conditions** screen.

4.1 Test Setup

The **Test Setup** screen allows you to configure test parameters such as test time and test repeat.

To configure test setup

1. Select the appropriate mode, and then tap **Mode Setup**.
2. From the **Mode Setup** screen, tap **Test Conditions** (see Figure 4-1 on page 49).
3. From the **Test Conditions** screen (see Figure 4-1 on page 49), tap the Test/Tools button ( ).

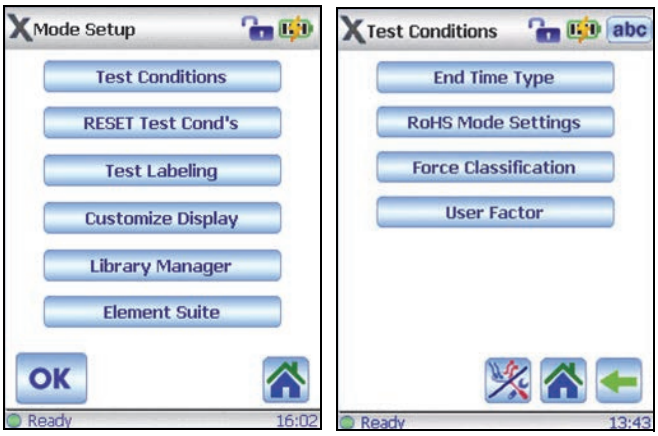


Figure 4-1 RoHS mode setup

4. In the **Test Setup** screen, enter minimum and maximum test times for each beam (see Figure 4-2 on page 50).

   The test times you enter depend on the degree of precision required. Longer test times may increase precision.
5. Enter additional variables as needed (see Figure 4-2 on page 50), including:
   - The number of times you wish to repeat the test.
   - Whether to generate an average of all tests in the test set.
   - Whether to display a confirmation message before each test in a test series.
6. If your analyzer is equipped with a camera, tap **Camera** to set camera parameters.
7. Tap **OK** to save your changes and return to the **Test Conditions** screen.

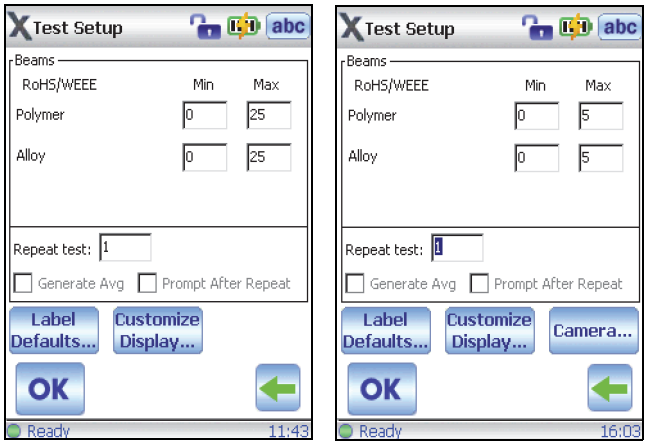


Figure 4-2 RoHS test setup

4.2 End Time Type

You can control how test end time is calculated using the **End Time Type** parameter.

To set End Time Type

1. From the **Test Conditions** screen, tap **End Time Type** (see Figure 4-3 on page 51).
2. To choose how the test end time is calculated, select **RealTime** or **LiveTime**.
   - **RealTime** is the total time that the analysis takes when measured on a standard clock This is the most commonly selected option.
   - **LiveTime** is the actual time during which the analyzer collects data. Since the analyzer does not always collect data throughout a measurement, **LiveTime** is less than **RealTime**. (**LiveTime** is used primarily in laboratory applications where precise and repeatable test times are required).

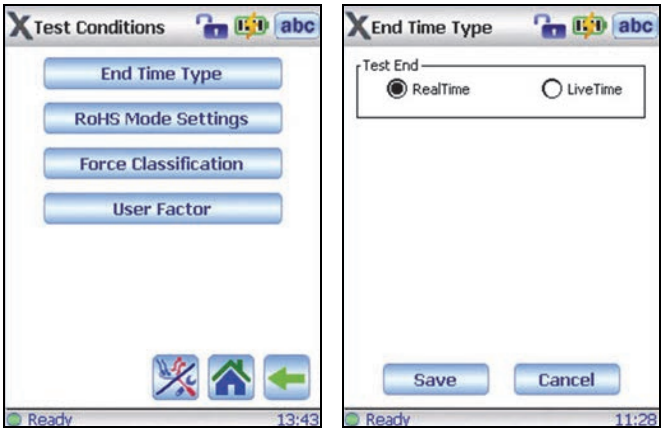


Figure 4-3 End Time Type

3. Tap **Save** to save your changes and return to the **Test Conditions** screen.

4.3 RoHS Mode Settings

Settings available in RoHS mode include **Action Level** and **Set End Condition** and **Surface Pb**.

4.3.1 Action Level

To set the action level

1. From the **Test Conditions** screen, tap **RoHS Mode Settings**, followed by **Action Level** (see Figure 4-4 on page 51).
2. Select the **IEC Guideline** or **User Defined** check box, and then enter a **User Defined nSigma** value (default is 3.0).
3. Tap **Back** to return to the **Test Conditions** screen.

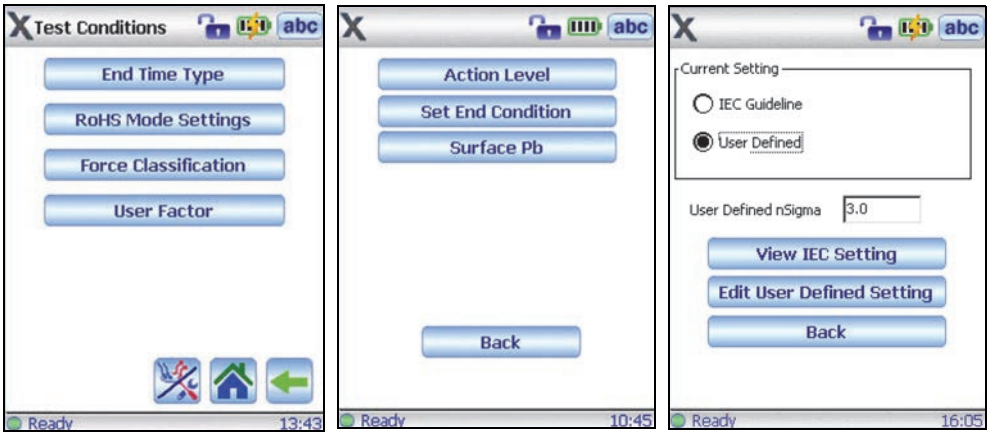


Figure 4-4 Action level settings

4.3.1.1 Viewing IEC Setting

IEC Guidelines are commonly accepted screening values for XRF testing.

To view IEC settings

1. From the **Test Conditions** screen, tap **Action Level** (see Figure 4-5 on page 52).
2. In the **Current Setting** area, select the **IEC Guideline** check box, and then tap **View IEC Setting**.

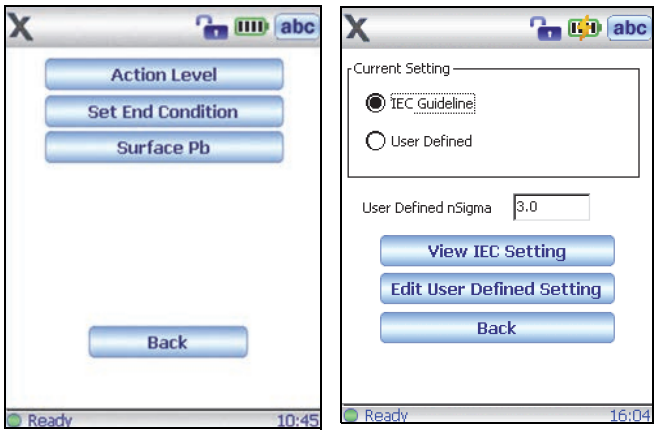


Figure 4-5 RoHS action level

3. Tap **Alloy** to view the IEC alloy complement of elements and action level pass/fail values (see Figure 4-6 on page 52).

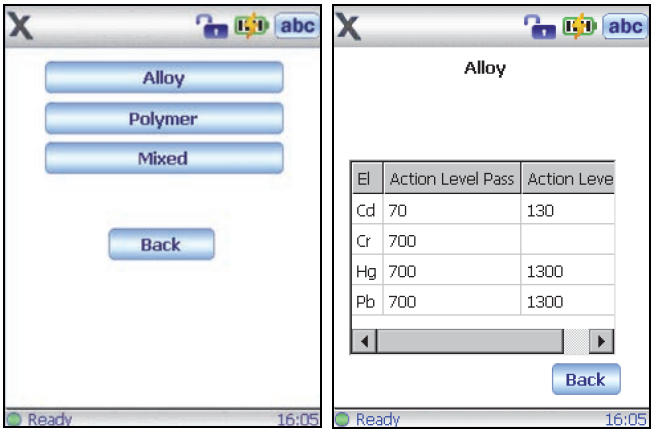


Figure 4-6 IEC alloy settings

4. Tap **Polymer** to view the IEC polymer complement of elements and action level pass/fail values (see Figure 4-7 on page 53).

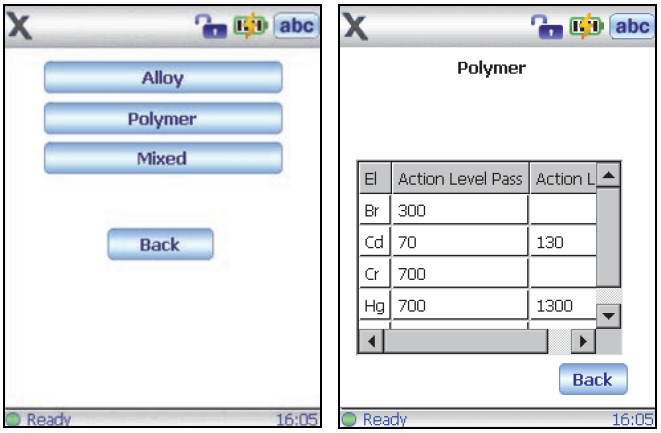


Figure 4-7 IEC polymer settings

5. Tap **Mixed** to view the IEC mixed complement of elements and action level pass/fail values (see Figure 4-8 on page 53).
6. Tap **Back** to return to the RoHS mode screen.

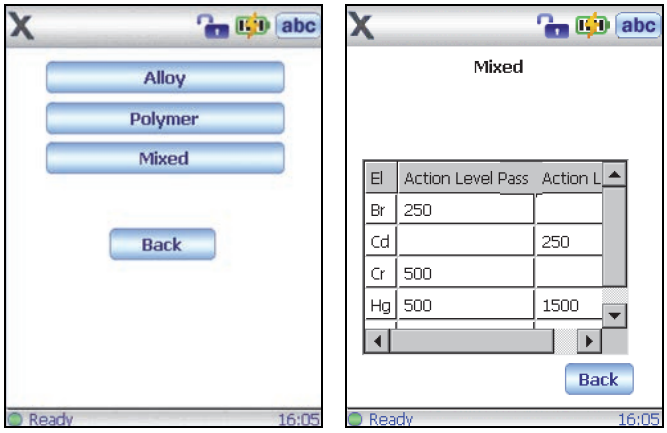


Figure 4-8 IEC mixed settings

4.3.1.2 Editing User Defined Settings

In some circumstances, users may choose to apply their own screening values in place of the IEC settings. The available settings are:

- List of test elements
- Pass/fail/inconclusive levels

To edit user defined settings

1. From the **Test Conditions** screen, tap **Action Level** (see Figure 4-9 on page 54).
2. In the **Current Setting** area, select the **User Defined** check box, and then tap **Edit User Defined Setting**.

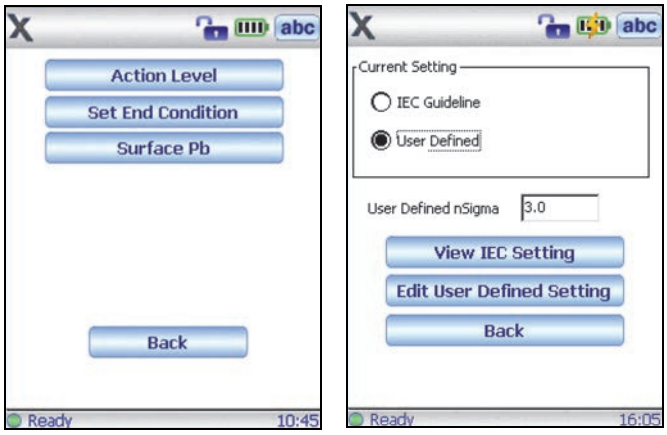


Figure 4-9 RoHS user defined settings

3. Select **Alloy, Polymer**, or **Mixed** (see Figure 4-10 on page 54).

Figure 4-10 RoHS user defined alloy

4. Tap **Add Row** or **Delete Row** to change the list of test elements.
5. To add an element and change pass/fail levels:
   a) Tap **Add Row** to add a new empty row to the list (see Figure 4-11 on page 55).
   b) Tap in the empty **Element** cell, and then select the desired element.
   c) Tap the **Pass Level** cell to enter a pass level value.
   d) Tap the **Fail Level** cell to enter a fail level value.
   e) Tap **Save** to save your changes and return to the action level screen.

Figure 4-11 RoHS user defined settings (adding)

NOTE

- Setting pass and fail action levels equal to each other, and setting nsigma to 0.1 effectively eliminates the inconclusive range, giving only a pass/fail result. To use this option, make sure that the test time is long enough for each element's LOD to drop below the action level for typical samples, and long enough to make a clear pass/fail determination.
- Additionally, each classification (Polymer/Mixed/Alloy) has its own set of action levels. For example, changing Polymer settings will not affect Mixed settings.

---

6. To delete a row from the element list:
   a) Select **Alloy**, **Polymer** or **Mixed** (see Figure 4-12 on page 55).
   b) Tap and drag to highlight the row you wish to delete.
   c) Tap **Delete Row** to remove it.

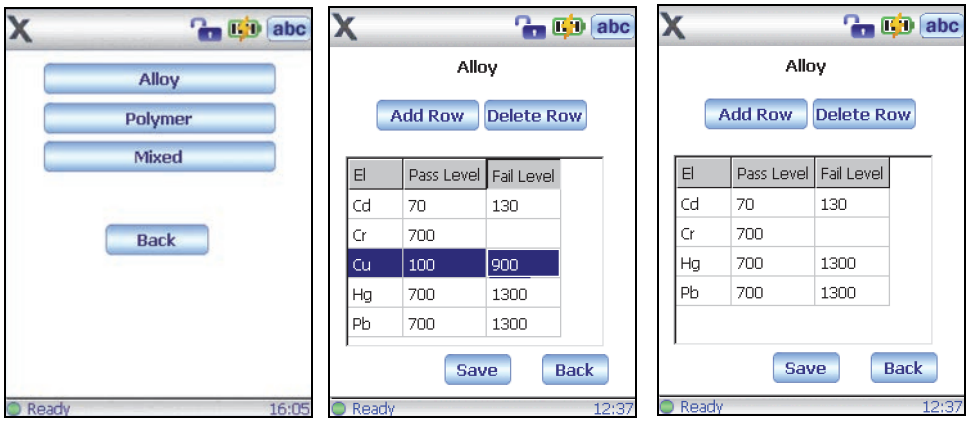


Figure 4-12 RoHS user defined settings (deleting)

7. Tap **Save** to save your changes and return to the action level screen.
8. Tap **Back** to return to the mode settings screen without saving your changes.

4.3.2 Set End Condition

The **Set End Condition** parameter controls when a test is terminated.

To Set End Condition

1. From the **Test Conditions** screen, tap **Mode Settings**, followed by **Set End Condition** (see Figure 4-13 on page 56).
2. Choose a type of **Test End Condition** that meets your testing requirements.
   - **Maximum time**: Test continues for maximum time set. This option is most commonly selected.
   - **Action Level**: Test continues until pass or fail determination based on action level is made.
   - **Classification**: Test continues until sample is classified as Polymer, PVC, Mixed, or Alloy. This option is commonly used for quickly sorting PVC (Cl >> 1 %) and non-PVC plastics.
3. Tap **Back** to save your changes and return to the mode settings screen.

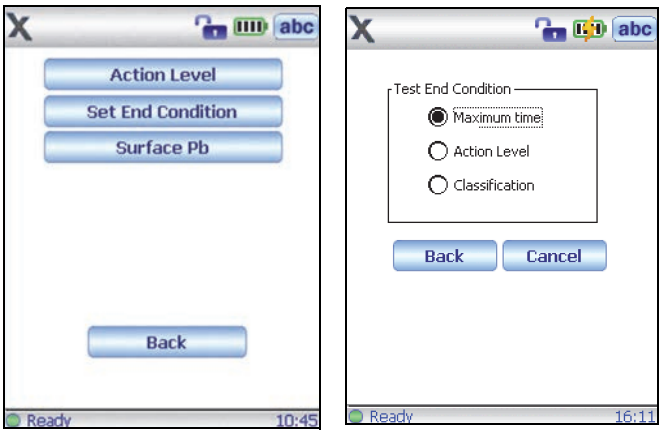


Figure 4-13 RoHS set end condition settings

4.3.3 Surface Pb

Surface Pb parameters aid in testing for lead (Pb) that may be present in a surface coating.

To set Surface Pb parameters

1. From the **Test Conditions** screen, tap **Mode Settings**, followed by **Surface Pb** (see Figure 4-14 on page 57).
2. Choose the appropriate **Surface/Bulk Classification**:
   - **Bulk**: Will display detected Pb only in ppm. Select this option when testing most uncoated samples. The analyzer will assume that all detected Pb is distributed homogeneously in a bulk material. This is the default option.
   - **Surface**: Will display detected Pb only in ug/cm^2. Select this option when only testing samples with some surface coating, e.g. a paint layer. The analyzer will assume that all detected Pb is present in a thin coating layer on the surface.

- **Auto**: Will display Pb results in both ppm and ug/cm^2. The software will also choose whether any Pb detected is likely from a surface layer (if present) or the substrate. The appropriate Pb result will be colored blue.

NOTE

The **Auto** option is only for reference and does not affect the analysis. Pb results in ppm are only valid for bulk samples. Results in ug/cm^2 are only valid for coated samples when the Pb content is present only in the coating layer. Auto reports both values for convenience, but they are based on different calibrations and different assumptions, and are mutually exclusive.

---

3. **Cutoff Ration** and **N Sigma** parameters are instrument settings and should not be changed.
4. In the **Pass/fail Determination** area, enter **Action Level Pass** and **N Sigma** values based on surface Pb screening value.

NOTE

The Surface Pb pass/fail is separate from the RoHS pass/fail criteria and is not considered in determining the overall pass/fail judgement for the sample.

---

5. Tap **Back** to save your changes and return to the mode settings screen.

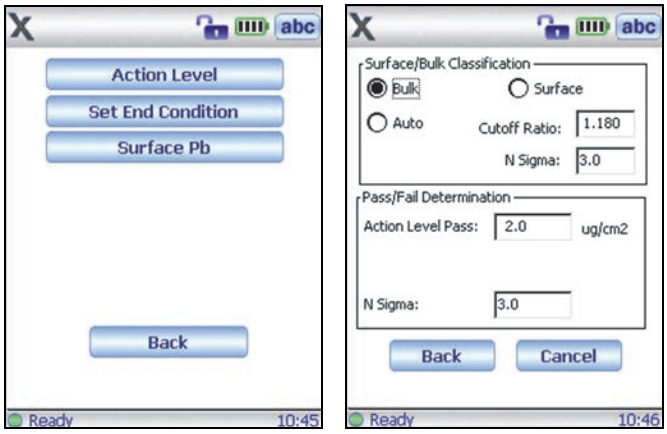


Figure 4-14 Surface Pb

4.4 Force Classification

Force classification parameters aid in the identification of certain materials.

To set force classification

1. From the **Test Conditions** screen, select **Force Classification** (see Figure 4-15 on page 58).
2. Choose the appropriate classification method:
   - **Automatic**: Allow analyzer to choose which beam and calibration matches the current sample.

- **Alloy**: Always test sample using the alloy/metals calibration (beam 2). This option is useful when testing aluminum alloys, as these will not be automatically classified as alloy.
- **Polymer**: Always test sample using the polymer calibration (beam 1). Beam 1 is also used when testing mixed samples.

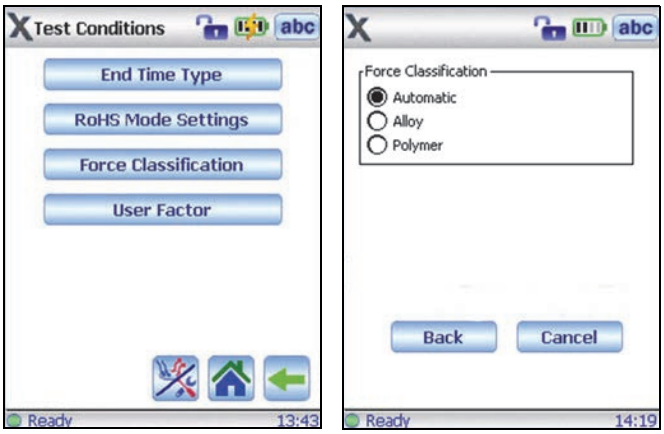


Figure 4-15 Force classification

4.5 User Factor (RoHS/WEEE Specific)

Your Olympus DELTA analyzer is optimized at the factory to detect a broad range of elements. You may be able to improve detection accuracy for your particular elements of interest by creating user factors with custom **Factor** and **Offset** variables.

You can create multiple user factors and recall them at any time without altering the factory settings.

Before you begin, determine appropriate factor and offset values for your particular elements of interest.

To set the user factor

1. On the **Test Conditions** screen, tap **User Factor** (see Figure 4-16 on page 59).
2. Choose the appropriate beam:
   - **Polymer High-B1** for Polymer/Mixed testing using beam 1.
   - **Alloy High-B2** for Alloy testing using beam 2.

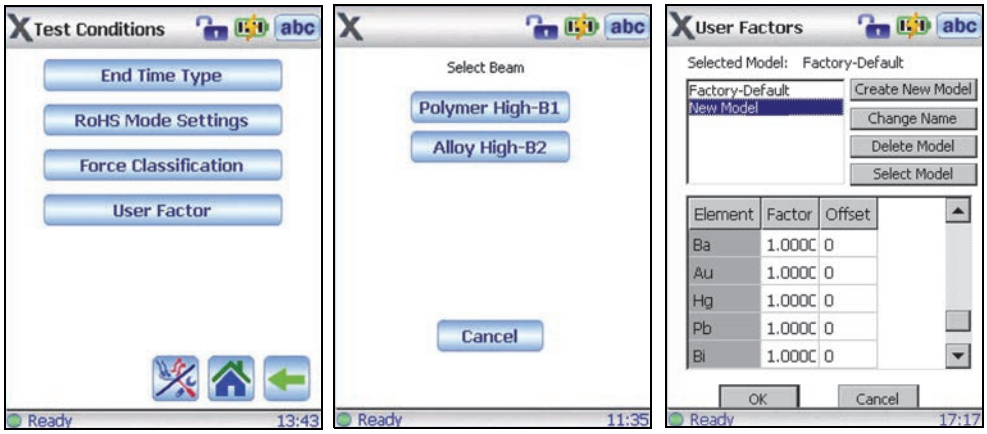


Figure 4-16 RoHS user factors

3. On the **User Factors** screen, tap **Create New Model** (see Figure 4-17 on page 59).
4. Tap **Change Name** to rename the selected model.
5. Using the scroll box, select an element of interest.
6. Enter the **Factor** and **Offset** values for that element.
7. Continue selecting elements and setting factor and offset values for each remaining element of interest.

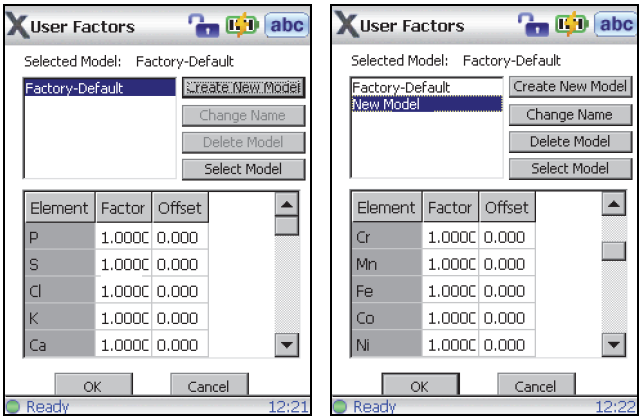


Figure 4-17 RoHS user factors *(continued)*

8. Tap **OK** to save your changes and return to the **Test Conditions** screen.

5. Thin Modes

Thin modes include Dust Wipe, Filter Analysis, and Lead Paint. These modes are similar except for the number of beams used in testing. Other differences are noted where applicable.

Mode setup involves setting test conditions such as **Test Setup**, **End Time Type**, **User Factor** and **Packaging Directive**. Settings are accessed using the **Test Conditions** screen.

5.1 Test Setup

The **Test Setup** screen allows you to configure test parameters such as test time and test repeat.

To configure test setup

1. Select the appropriate mode, and then tap **Mode Setup**.
2. From the **Mode Setup** screen, tap **Test Conditions** (see Figure 5-1 on page 61).
3. From the **Test Conditions** screen, tap the Test/Tools button ( ).

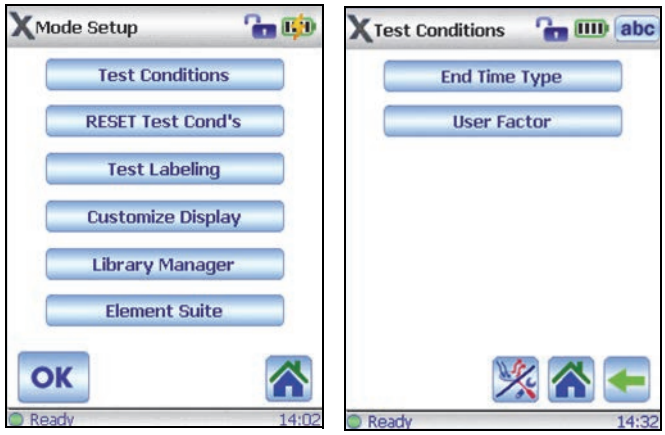


Figure 5-1 Mode setup and test conditions (Dust Wipe, Filter Analysis, and Lead Paint)

4. In the **Test Setup** screen, enter minimum and maximum test times for each beam (see Figure 5-2 on page 62).
   The test times you enter depend on the degree of precision required. Longer test times may increase precision.

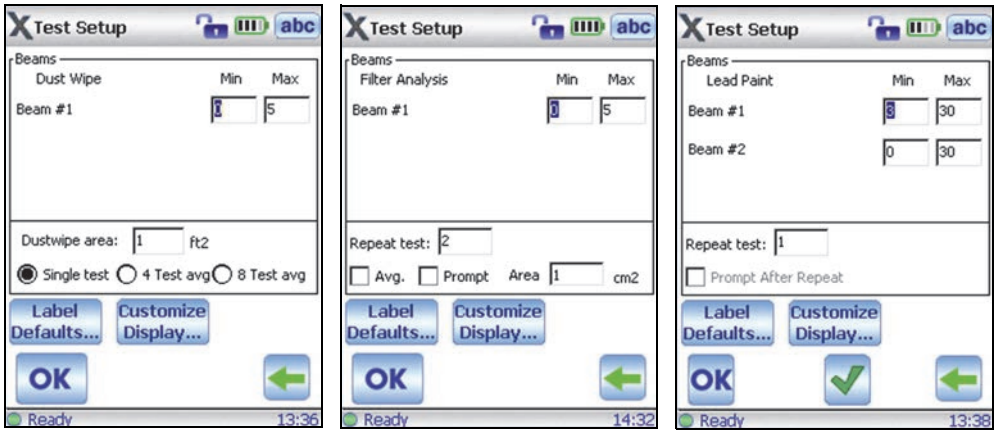


Figure 5-2 Test setup — Dust Wipe *(left)*, Filter Analysis *(middle)*, and Lead Paint *(right)*

5. Enter additional variables as needed, including:
   - The size of the area being tested (Dust Wipe and Filter modes).
   - The number of times you wish to repeat the test (Filter and Lead Paint modes).
   - Whether to generate an average of all tests in the test set (Dust Wipe and Filter modes).
   - Whether to display a confirmation message before each test in a test series (Filter and Lead Paint modes).
6. Tap **OK** to save your changes and return to the **Test Conditions** screen.

5.2 End Time Type

You can control how test end time is calculated using the **End Time Type** parameter.

To set End Time Type

1. From the **Test Conditions** screen, tap **End Time Type** (see Figure 5-3 on page 63).
2. To choose how the test end time is calculated, select **RealTime** or **LiveTime**.
   - **RealTime** is the total time that the analysis takes when measured on a standard clock This is the most commonly selected option.
   - **LiveTime** is the actual time during which the analyzer collects data. Since the analyzer does not always collect data throughout a measurement, **LiveTime** is less than **RealTime**. (**LiveTime** is used primarily in laboratory applications where precise and repeatable test times are required).

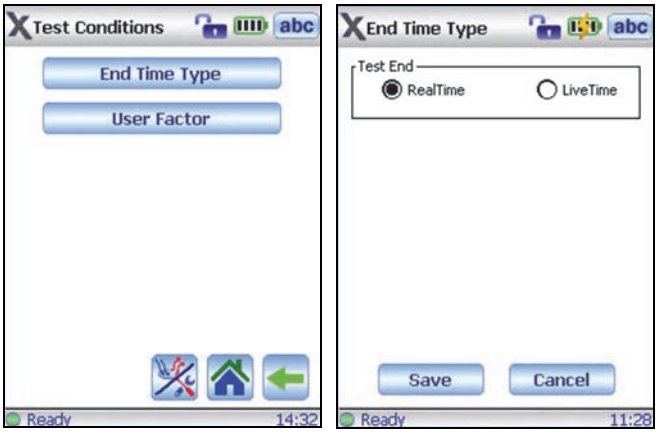


Figure 5-3 End Time Type

3. Tap **Save** to save your changes and return to the **Test Conditions** screen.

5.3 User Factors

Your Olympus DELTA handheld XRF analyzer is optimized at the factory to detect a broad range of elements. You may be able to improve accuracy for your particular elements of interest by creating user factors with custom **Factor** and **Offset** variables. User factors allow you to adjust the results for your particular sample matrix. This is also known as site specific calibration.

You can create multiple user factors and recall them at any time without altering the factory settings. See Appendix E on page 129 for more information.

To set user factors

Before you begin, determine appropriate **Factor** and **Offset** values for your particular elements of interest.

To set user factors (Dust Wipe and Filter Analysis)

Before you begin, determine appropriate **Factor** and **Offset** values for your particular elements of interest.

1. From the **Test Conditions** screen, tap **User Factor** (see Figure 5-4 on page 64).
2. On the user factor screen, tap **Create New Model**.
3. Tap **Change Name** to rename the selected model.
4. Using the scroll box, select an element of interest.

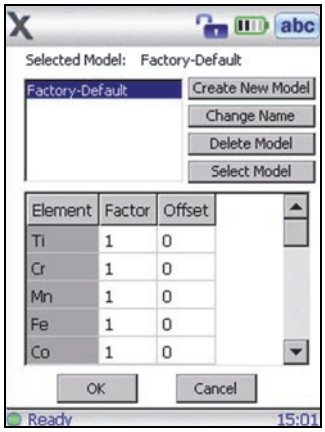


Figure 5-4 User factors (Dust Wipe and Filter Analysis)

5. Enter **Factor** and **Offset** values for that element (see Figure 5-5 on page 64).
6. Continue selecting elements and setting factor and offset values for each remaining element of interest.
7. Tap **OK** to save your changes and return to the **Test Conditions** screen.

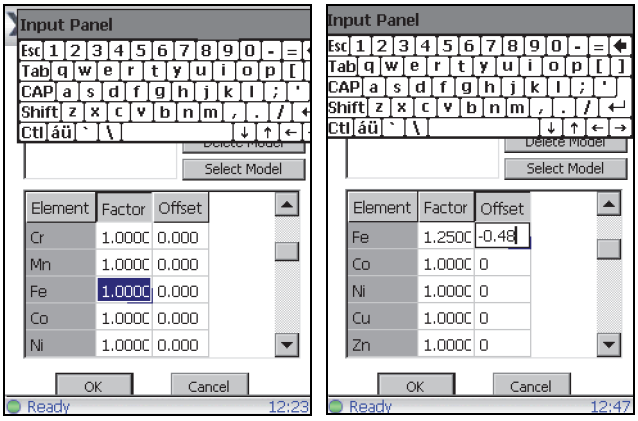


Figure 5-5 Setting user factors (Dust Wipe and Filter Analysis)

5.4 Lead Paint (Test End Condition)

Test end conditions particular to Lead Paint mode are accessed from the **Test Conditions** screen.

To set Lead Paint (Lead Paint mode only)

1. From the **Test Conditions** screen, tap **Lead Paint** (see Figure 5-6 on page 65).
2. Select a test end condition from the following options:
   - Select **Inspection** to end the test when the inspection parameter is met.
   - Select **Fixed Time** to end the test when a previously set time is reached.
   - Select **Force 2nd Beam** to always use both beams when testing.

3. Enter additional options as needed, including:
   - Action level (1.0 mg/cm^2 by default).
   - Whether to display the statistical error (+/-) on the **Results** screen.
4. Tap **Save** to save your changes and return to the **Test Conditions** screen.

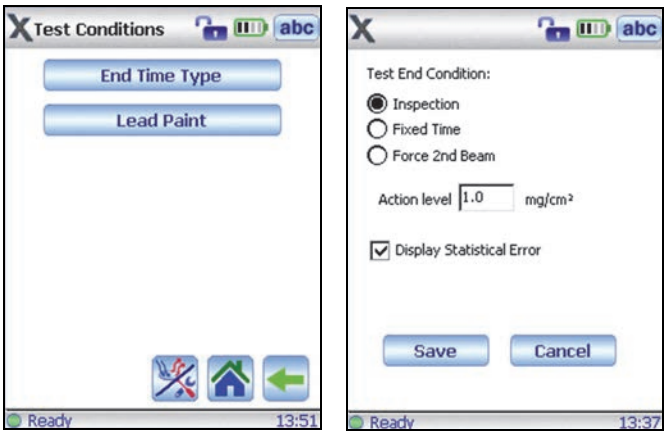


Figure 5-6 Lead Paint test end condition

6. Universal Mode Settings

Universal mode settings are available in all modes and are identical from mode to mode with some exceptions, which are noted.

The Universal mode settings are:

- **Reset Test Cond's** (reset test conditions)
- **Test Labeling**
- **Customize Display**
- **Element Suite**.

The primary access point for these mode settings is through the **Mode Setup** screen (see Figure 6-1 on page 67). The **Test Conditions** button is not covered in this section because it has settings tailored to the selected mode. The test condition settings for each mode are discussed in the corresponding section. The **Library Manager** button is not covered because it is for the Alloy modes only, and is covered in that section.

Figure 6-1 Mode Setup screen

6.1 Reset Test Conditions

The Reset Test Conditions function returns test times and other parameters to their default settings (see Table 4 on page 68 and Table 5 on page 68).

Table 4 Default test times

	Min. time	Default max. time		
Modes	**All Beams**	**Beam 1**	**Beam 2**	**Beam 3**
Alloy	0	5	30	N/A
Alloy Plus	0	5	30	N/A
Fast ID	0	5	n/a	N/A
Geochem	0	30	30	N/A
Halogen Free	0	30	90	N/A
Mining	0	30	N/A	N/A
Mining Plus	0	30	30	N/A
RoHS	0	30	120	N/A
Soil	0	30	30	30
Pb Paint	0	30	20	N/A
Filter	0	30	N/A	N/A
Dust Wipe	0	30	N/A	N/A

Table 5 Other default parameters

MODE	Parameter
Alloy	Quicksort
Alloy	Al Mode = On
Alloy Plus	Two Beams Always Al, Si, Mg, S, P
RoHS	End of Test = Max. Time
RoHS	Classification = Auto
RoHS	Action Level = IEC Guideline
SmartBeam	Quicksort

To reset the test conditions

1. Tap **RESET Test Cond's** (see Figure 6-1 on page 67) to display the password screen (see Figure 6-2 on page 69).
2. In the **User** and **Password** boxes, enter the logon information using the **Input Panel**.
3. Tap **OK**.
4. When you receive the following message, tap **Yes** (see Figure 6-2 on page 69).
   "Are you sure you want to reset the test conditions for all modes."

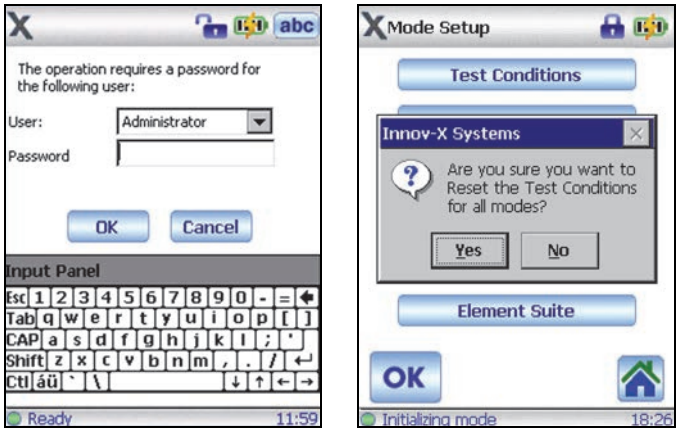


Figure 6-2 Password screen *(left)* and reset message (right)

6.2 Test Labeling

Test labels contain text that can be displayed on the screen after a test is run. The test labeling capability can be accessed from either the **Mode Setup** screen or the **Test Setup** screen.

To display the test labels screen

- In the **Mode Setup** screen, tap **Test Labeling**.
  OR
  In the **Test Setup** screen, tap **Label Defaults**.
  See Figure 6-3 on page 69.

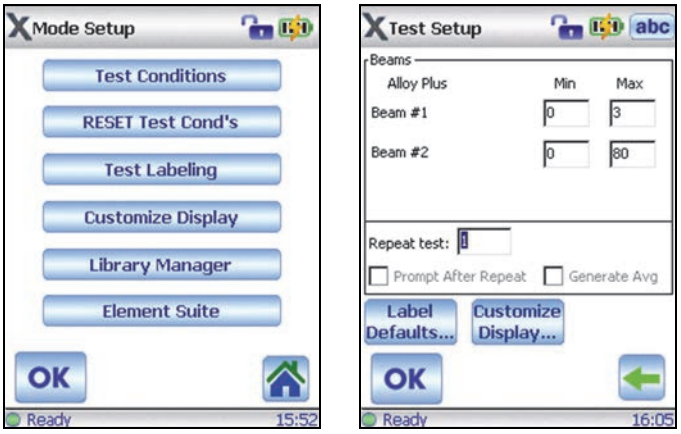


Figure 6-3 Screens for accessing test labeling

To set up test labeling

1. In the **Label Setup** screen (see Figure 6-4 on page 70), select an **Enable** check box to enable a field for display in test results.
   There are eight rows. A row consists of an **Enable** check box, a **Label** box, and a **Value** box.

NOTE

Test label rows seven and eight are used to hold the longitude and latitude values when a portable GPS unit is connected to the analyzer.

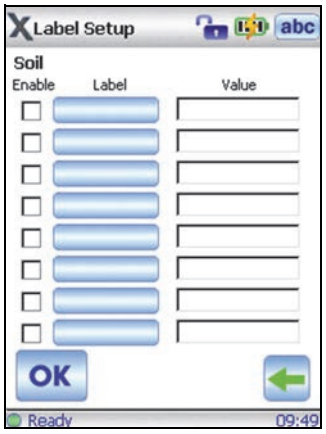


Figure 6-4 Label Setup screen

2. Tap a **Label** box to display the **Test Label Setup** screen.

   The number of the selected **Label** box is displayed at the top of the screen. There are three variations of the **Test Label Setup** screen (see Figure 6-5 on page 70). The variation depends on the selected style in the **Style** list.

NOTE

The selected style determines the format of the **Value** parameter in the **Label Setup** screen (see Figure 6-4 on page 70).

Figure 6-5 Test Label Setup screen variations

3. In the **Style** list, select one of the style variations.

6.2.1 Setting Up Text Style

The **Text** Style causes the **Value** box (in the **Label Setup** screen) to display as text. The text entered in the **Name** box is the actual label text (see Figure 6-6 on page 71).

To set up the text style

1. Tap in the **Name** box, and then enter text.
2. To display the field in the test results, select the **Show with Result** check box.
3. Tap **OK** to save the change.

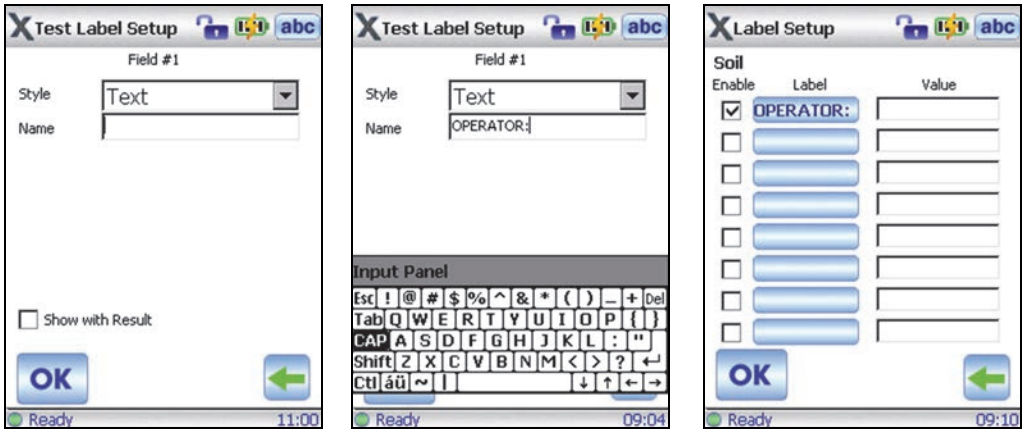


Figure 6-6 Text style setup

NOTE

The **Show with Result** option can only be used with one test label at a time.

6.2.2 Setting Up Fixed List Style

The **Fixed List** style causes the **Value** box (in the **Label Setup** screen) to display as a list of data (see Figure 6-7 on page 72).

To set up the Fixed List style

1. Tap in the **Add** box, and then enter a value.
   The **Value** box (in the **Label Setup** screen) is displayed as a list of data.
2. Tap **Add** to add the value to the **Data** list.
3. Continue to populate the data list by repeating steps 1 and 2.

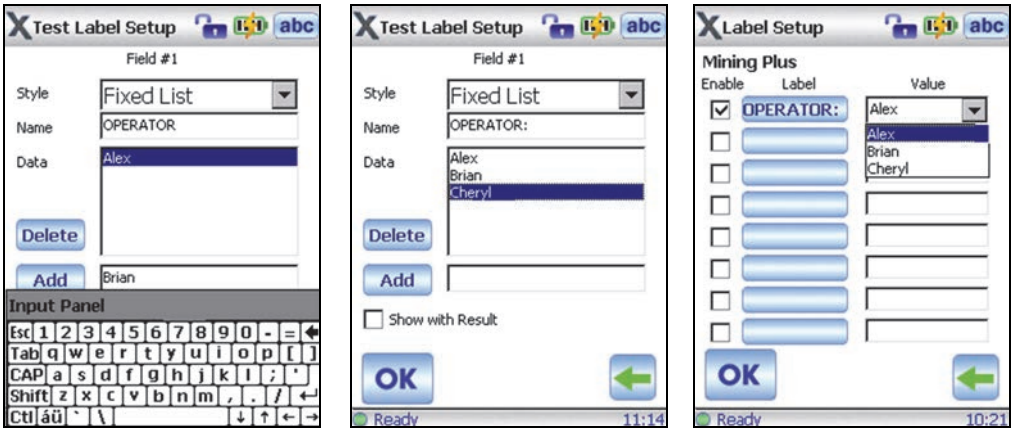


Figure 6-7 Test Label Setup screen — Populating the Fixed List

4. To delete a data value, select the value, and then tap **Delete**.
5. Enter the Label text in the **Name** field.
6. To display the field in the test results, select the **Show with Result** check box.
7. Tap **OK**.

NOTE

The **Show with Result** option can only be used with one test label at a time.

6.2.3 Setting Up the Auto Incrementing Style

The **Auto Incrementing** style causes the **Value** box (in the **Label Setup** screen) to increment by the number entered in the **Step** box. For example, if the value entered in the **Step** box is 1, then the value (entered in the **Value** box) in the **Label Setup** screen increments by one after each test. So the tests will be numbered: 1, 2, 3, 4, etc. If the value in the **Step** box is 4, then the tests will be numbered 1, 5, 9, 13, etc.

To set up Auto Incrementing

1. In the **Step** box, enter a number to set the incremental value (see Figure 6-8 on page 73).
2. To display the box in the test results, select the **Show with Result** check box.
3. Tap **OK**.
4. In the **Value** box, enter a number to set the first test number.
5. Tap **OK**.

Figure 6-8 Sequence for setting up Auto Incrementing

NOTE

The **Show with Result** option can only be used with one test label at a time.

The following example demonstrates a sequence of three **Test** screens when the auto incrementing step is set to 3, and the (initial) **Value** is set to 1 (see Figure 6-9 on page 73).

Figure 6-9 Auto Incrementing test label sequence

6.2.4 Viewing Test Labels in the Test or Results Screen

To view test labels in the Test or Result screen

1. Tap the Info button ( ).
   An alternate **Test** screen displays the information from the test labels.

   Tap the Back button ( ) to return to the main **Test** screen.

6.2.5 Test label editing options

Test labels can be edited before or after a test is run.

To edit test labels before a test is run

- In the Admin Prefs screen, select one of the **Pre-Test Edit Options** (see Figure 6-10 on page 74) [see section 1.5 on page 13 for more information].
  - **Force** forces you to edit the test label before the test is run.
  - **Optional** gives you the option of tapping the Info button in the **Test** screen to edit the label before running the test.

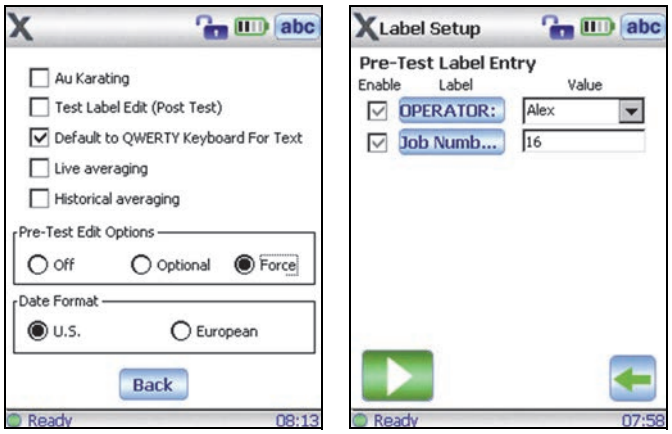


Figure 6-10 Pre-test label editing sequence

To edit test labels after tests are run

1. In the Admin Prefs screen, select the **Test Label Edit (Post Test)** check box (see section 1.5 on page 13 for more information).
   This selection causes an **Edit** button to appear on the **Results** screen, giving you the option of editing the test results.
2. In the **Results** screen, select a test.
3. Tap **Edit**, then edit the results in the **Edit Test Info** screen.
4. Tap **OK**.
   The sequence of screens in Figure 6-11 on page 75 shows the above procedure.

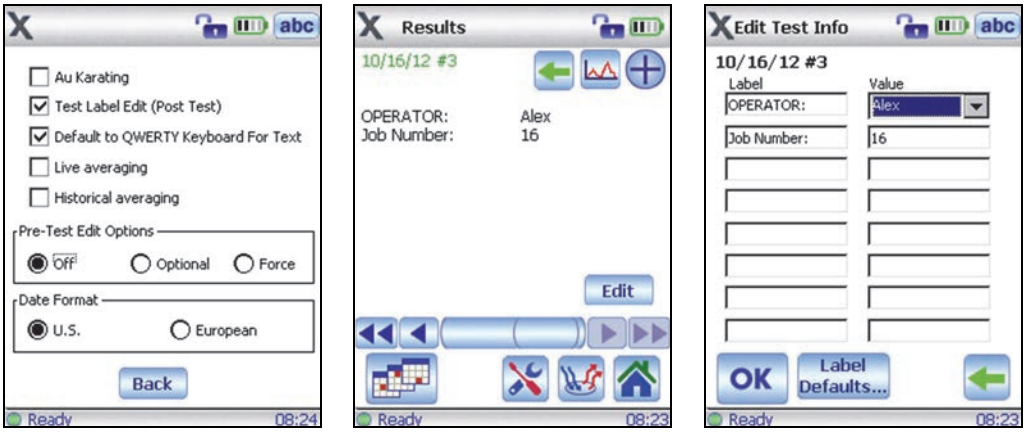


Figure 6-11 Post test label editing sequence

6.3 Customize Display Function

The Customize Display function sets the display parameters and screen behavior for the selected mode. There are two entry points to display the **Custom Disp** screen.

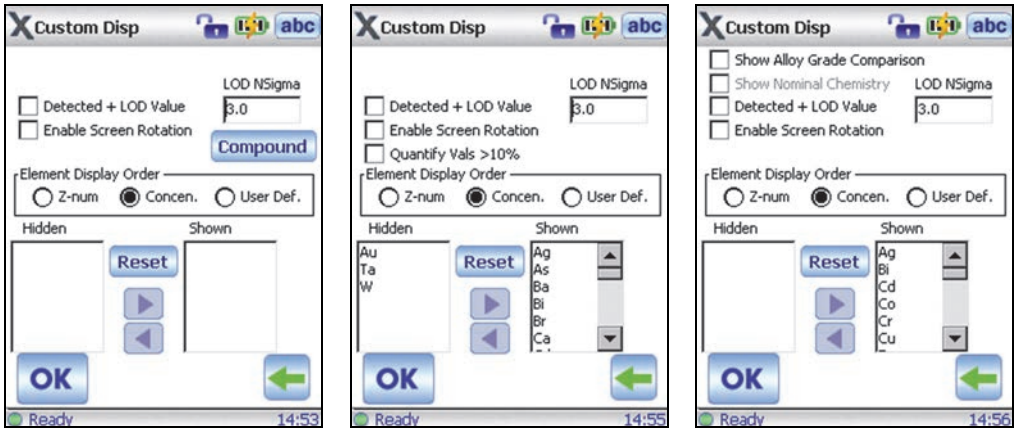
To access the Customize Display function

- In the **Mode Setup** screen, tap **Customize Display** (see Figure 6-12 on page 75 [*left*]).
  OR
  In the **Test Setup** screen, tap **Customize Display** (see Figure 6-12 on page 75 [*right*]).

Figure 6-12 Screens for accessing Customize Disp screens

6.3.1 Selecting the Check Box, LOD NSigma, and Compound Options

There are three variations of the **Customize Disp** screen (see Figure 6-13 on page 76):



Mining Plus & Mining | Soil & RoHS/WEEE | Alloy & Alloy Plus

Figure 6-13 Custom Disp screens

Common Custom Disp screen elements

1. Select the **Detected + LOD Value** check box to see a detected value and the limit of detection value for non detected elements.
2. Tap the **LOD NSigma** box, and then enter a value to set the detection parameter.

   The NSigma value gives the "statistical confidence" for detection. An NSigma value of 3.0 is typical for most applications. Ensure that an NSigma value of 3.0 is acceptable for your testing requirements.

   An NSigma value of 0 will show all elements as detected and will report the calculated result and uncertainty (+/-) for all elements. No elements will be shown as "<LOD." This option is normally used only in advanced applications, and is not available in Alloy or Lead Paint modes.
3. Select the **Enable Screen Rotation** check box to make the screen rotate when the analyzer is inverted.

Additional check box for Soil and RoHS modes

- Select **Quantify Vals > 10%** to display the element values that are greater that 10 %. In practice this is generally not useful because these modes are calibrated for trace elements.

Additional check boxes for Alloy modes

1. Select **Show Alloy Grade Comparison** to have **Test** or **Result** screens indicate alloy grades matched and match numbers.
2. Select **Show Nominal Chemistry** to have **Test** or **Result** screens list the elements inferred as included in a test based on the grade match.

Compound button for Mining modes

1. Tap **Compound** to display the compound screen (see Figure 6-14 on page 77).
2. Select the **Enable Compound Display** check box to display the compounds in the **Test** screen and exported results
3. Select the **Suppress sum > 100% msg (Reset on restart)** check box to prevent the "Caution: Sum > 100%" message from being displayed in the **Test** and **Results** screens.

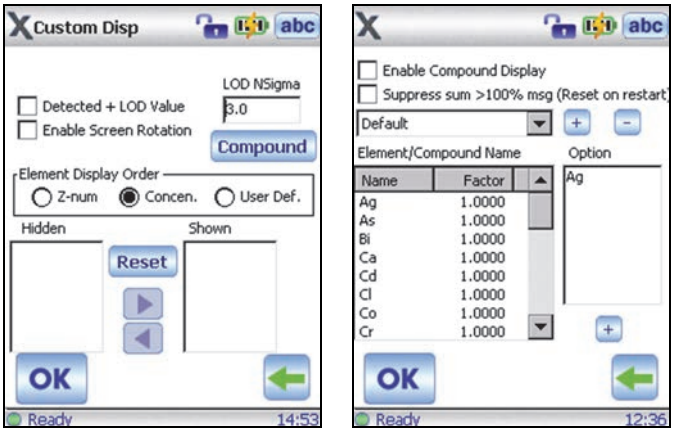


Figure 6-14 Custom Disp *(left)* and compound *(right)* screens

4. Tap the Plus (+) button located beside the **Default** list to display the **Add Compound Template** screen (see Figure 6-15 on page 77).
5. Enter a template name in the text box, and then tap **Save**.
6. In the compound screen, tap the down arrow, and then select the new template.
7. Select an **Element/Compound Name**.
8. Tap the Plus button under the **Option** box to display the **Add Compound** screen.
9. Add a compound of the same type selected in the previous screen.

   Representative acceptable compound names (forms) are Fe3O2 or Fe2(OH)2. The factor of the compound calculation (using Fe2(OH)2 as an example) is based on:

$$\frac{\text{Total atomic weight for Fe2(OH)2}}{\text{Total atomic weight for Fe2}}$$

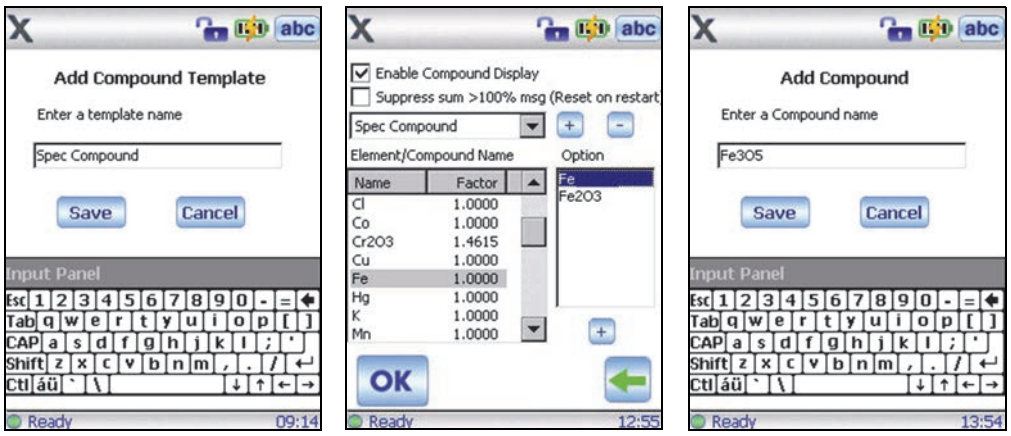


Figure 6-15 Sequence for adding a compound

In Figure 6-16 on page 78, the newly added compound shows up in the **Element/Compound Name** list, and is listed in the **Test** screen after running a test.

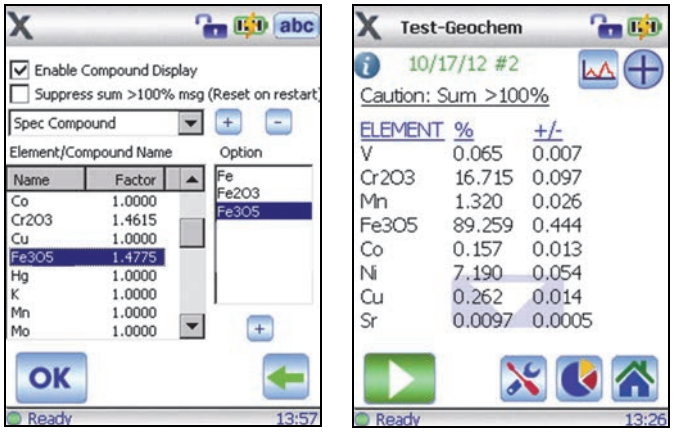


Figure 6-16 Compound screen with new compound and Test screen analysis

6.3.2 Element Display Order Options

Select one of the three **Element Display Order** options (see Figure 6-13 on page 76).

To order the display according to the atomic number

- Select **Z-num**.

To order the display according to the concentration in the test sample

- Select **Concen.**

To define a new display order

1. Select **User Def.**
2. Select an element, and then tap the left or right arrows (/) to move the element between the **Hidden** and **Shown** lists.
3. To change the order of an element in the **Shown** list, tap the up or down arrows (/).
4. To move all the elements back to the **Shown** list in their original order, tap **Reset**.
5. Tap **OK**.

6.4 Element Suite Screen

The **Element Suite** screen displays a listing of all the analysis elements that are provided by the chosen mode and its associated beam(s) [see Figure 6-17 on page 79].

To display the Element Suite screen

- In the **Mode Setup** screen, tap **Element Suite**.

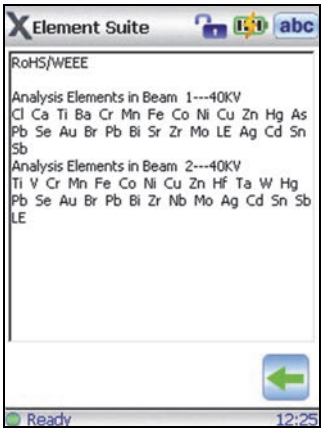

Element Suite
abc
RoHS/WEEE
Analysis Elements in Beam 1---40KV
Cl Ca Ti Ba Cr Mn Fe Co Ni Cu Zn Hg As Pb Se Au Br Pb Bi Sr Zr Mo LE Ag Cd Sn Sb
Analysis Elements in Beam 2---40KV
Ti V Cr Mn Fe Co Ni Cu Zn Hf Ta W Hg Pb Se Au Br Pb Bi Zr Nb Mo Ag Cd Sn Sb LE
Ready
12:25

Figure 6-17 Element Suite screen

7. Test

Sample testing, result monitoring and instrument calibration are accessed using the **Test** screen. This section describes the preliminary steps required before conducting a test, a typical test procedure, and testing best practices.

7.1 Before you begin

Before you begin testing, complete the following steps:

1. Turn on the DELTA handheld XRF analyzer (see section 7.2 on page 81).
2. Select a mode.
3. Configure test parameters using mode setup.
4. Verify instrument calibration, or conduct a cal check.

Once these steps are completed, the analyzer is ready for testing.

WARNING

To avoid potential radiation exposure:

- Do not point the analyzer at yourself or another person when testing.
- Do not hold a sample with your fingers or in the palm of your hand when testing.
- Always wear both a ring-style and a badge (either clip-on or lanyard-style) dosimeter.

7.2 Turning the Analyzer On and Off

Turning on the DELTA handheld XRF analyzer requires a power source (battery or AC) and understanding of the radiation safety notice.

To turn on the analyzer

1. Insert a charged battery or AC adaptor into the analyzer handle.
2. Turn on the analyzer using the power switch.
   The radiation safety notice appears.
3. Tap the Start Test button ( ) to confirm that you are a certified user.

NOTICE!
This instrument produces ionizing radiation. It should only be used by trained technicians.
Select START if you are a certified user.
START
QUIT

Figure 7-1 Radiation safety notice

System initialization begins. The analyzer launches a **Test** screen for the last selected mode (seeFigure 7-2 on page 82).

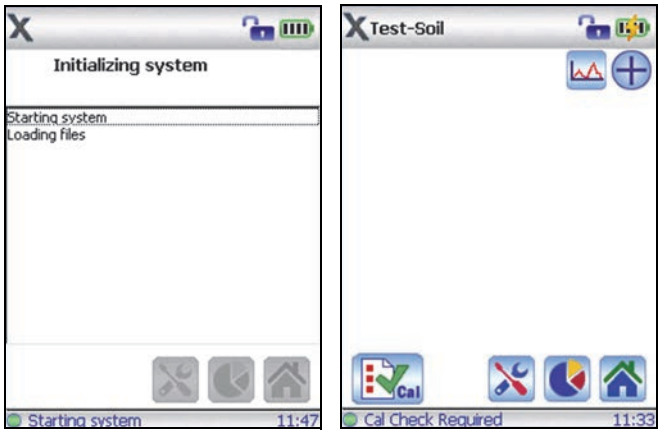


Figure 7-2 System initialization *(left)* and Test *(right)* screens

To turn off the analyzer

There are several equally effective ways to turn off the analyzer.

- Hardware method:
  - ◆ Press and hold the analyzer power switch until the green ON/OFF light is off.
- Software method:
  - *a)* From the **Home** screen, tap **Setup**.
  - *b)* Tap **Exit**.
  - *c)* On the exit screen, tap the Power Off button ( ).
  - *d)* Tap **Yes** to confirm that you want to shut down the analyzer (see Figure 7-3 on page 83).
- Emergency method:
  - ◆ Open the analyzer battery cover, and then remove the battery or AC adaptor.

NOTE

The analyzer includes “hot swap” technology that maintains 30 seconds of system power after the battery is removed.

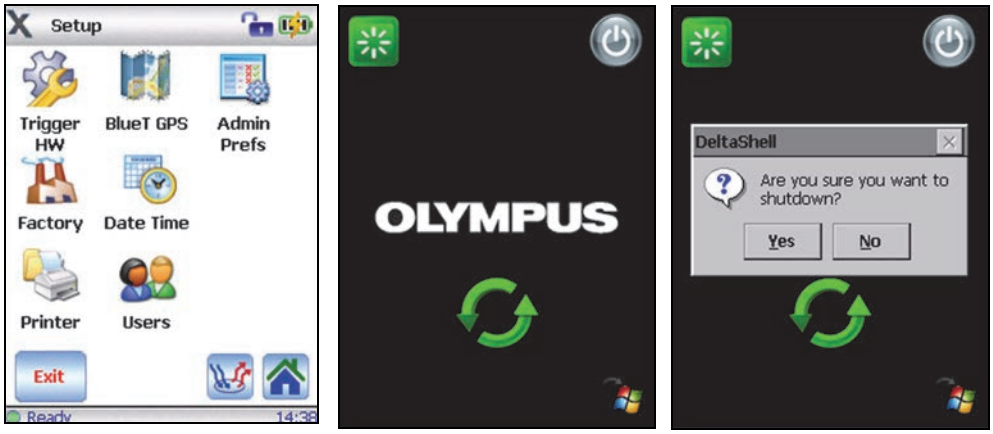


Figure 7-3 Turn off (software method)

7.2.1 Calibration Check

A calibration check (Cal Check) is a periodic system test to ensure that the DELTA handheld XRF analyzer is functioning within factory specifications. When the status message “Cal Check Required” is present, the analyzer requires a calibration check before testing can proceed.

During a Cal Check, the analyzer collects a spectrum on a known standard (Alloy 316 stainless steel). The analyzer then compares a variety of parameters to factory preset values. When comparisons are within preset tolerances, the analyzer passes Cal Check.

7.2.1.1 General Facts About Cal Check

- A Cal Check is required after 10 hours.
- The Start Test button ( ) and analyzer trigger are disabled until a successful Cal Check is achieved.
- You can run a Cal Check at any time (except during a test).
- When a Cal Check is in progress, the X-ray indicator light blinks, the X-ray tube is energized, and the filter wheel is operational.
- An on-screen status bar shows a completion percentage for the check.
- The Cal Check procedure takes 15 seconds.
- How you conduct a Cal Check depends on how the trigger setting parameter is set (standard, deadman, or two-hand).

7.2.1.2 Conducting a Cal Check

There are three different ways to perform a Cal Check procedure:

- Standard
- Deadman trigger enabled
- Two-hand operation enabled

To conduct a standard Cal Check

1. Navigate to the **Test** or **Test Setup** screen.
2. Place the supplied Cal Check coupon (316 stainless steel) on a flat surface.
3. Position the analyzer measurement window flush over the coupon.

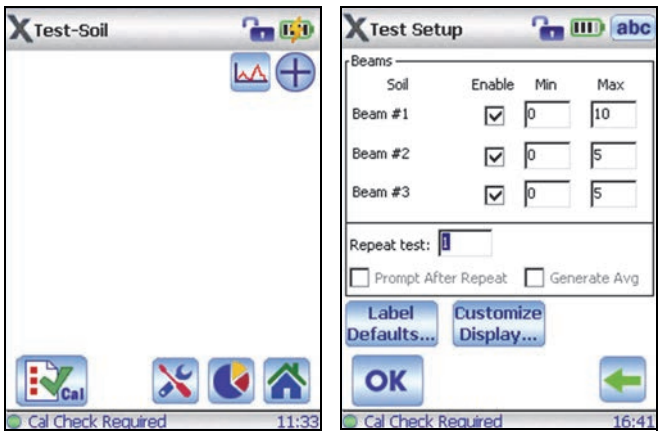


Figure 7-4 Test *(left)* and Test Setup *(right)* screens — Ready for Cal Check procedure

4. Tap the Cal Check button.
   The red X-ray indicator light begins blinking to indicate that X-rays are being emitted.

A Cal Check takes approximately 15 seconds to complete. The **Results** screen displays the status of the test Figure 7-8 on page 86.

To conduct a Cal Check with deadman trigger enabled

1. Navigate to the **Test** or **Test Setup** screen.
2. Place the supplied Cal Check coupon (316 stainless steel) on a flat surface.
3. Position the analyzer measurement window flush over the coupon.
4. Tap the Cal Check button.
   A dialog box appears on the **Test** screen
5. Read the instructions in the dialog box (see Figure 7-5 on page 85).
6. To cancel the Cal Check, tap **OK** or the **Close** button.

Test-Alloy Plus
Innov-X Systems
OK
Place and hold the analyzer over a 316 sample on a flat surface, then press and hold the trigger to perform a cal check.
Trigger
Ready
11:36

Figure 7-5 Dialog box with instructions for deadman trigger Cal Check operation

7. Pull and hold the trigger for the duration of the test.
   The red X-ray indicator light begins blinking to indicate that X-rays are being emitted.

A Cal Check takes less than 15 seconds to complete. The **Results** screen displays the status of the test Figure 7-8 on page 86.

To conduct a Cal CHeck with two-hand operation enabled

1. Navigate to the **Test** or **Test Setup** screen.
2. Place the supplied Cal Check coupon (316 stainless steel) on a flat surface.
3. Position the analyzer measurement window flush over the coupon.
4. Tap the Cal Check button.
   A dialog box appears on the **Test** screen
5. Read the instructions in the dialog box (see Figure 7-6 on page 85).
6. To cancel the Cal Check, tap **OK** or the **Close** button.

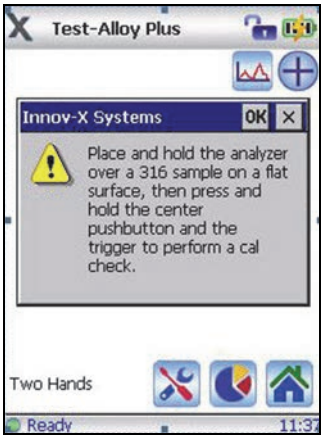

Test-Alloy Plus
Innov-X Systems
OK
Place and hold the analyzer over a 316 sample on a flat surface, then press and hold the center pushbutton and the trigger to perform a cal check.
Two Hands
Ready
11:37

Figure 7-6 Dialog box with instructions for two-hand operation Cal Check procedure

7. Press and hold both the center push button and the trigger for the duration of the test (see Figure 7-7 on page 86).
   The red X-ray indicator light begins blinking indicating that X-rays are being emitted.

Figure 7-7 DELTA special function push buttons

A Cal Check takes less than 15 seconds to complete. The **Results** screen displays the status of the test (seeFigure 7-8 on page 86).

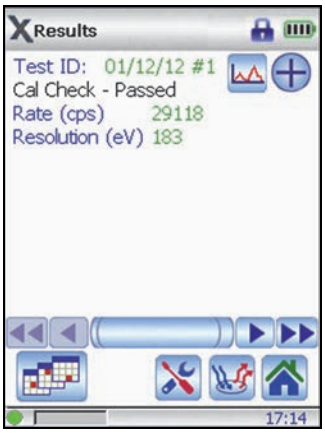


Figure 7-8 Results screen — Successful Cal Check

The message “Cal Check — Passed” indicates that the analyzer is ready for sample testing.

7.2.1.3 Troubleshooting a Cal Check

If the Cal Check fails:

- Ensure that the coupon is positioned correctly beneath the measurement window.
- Ensure that the X-ray indicator blinks during the procedure.
- Restart the analyzer
- Retry the Cal Check procedure.

NOTE

If the Cal Check fails repeatedly, contact Olympus customer service or your local distributor.

7.2.2 Conducting a sample test

Prior to beginning a testing session, review the testing best practices information (see section 7.3 on page 88).

WARNING

To avoid potential radiation exposure:

- Do not point the analyzer at yourself or another person when testing.
- Do not hold a sample with your fingers or in the palm of your hand when testing.
- Always wear both a ring-style and a badge (either clip-on or lanyard-style) dosimeter.

To conduct a test

1. Navigate to the **Test** screen.

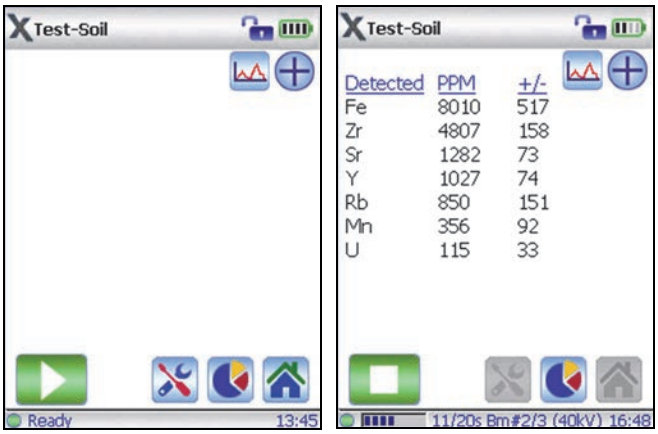


Figure 7-9 Test *(left)* and test in-progress *(right)* screens

2. Position the analyzer measurement window of the over the test sample.
3. Tap the Start Test button ( ), or pull the trigger to begin testing:
   - The lower status bar shows the progress of the test.
   - Results are displayed immediately upon test completion.
4. Tap the Spectrum button ( ) to view spectrum results.
5. Tap the Chemistry button ( ) to view chemistry results (see Figure 7-10 on page 88).

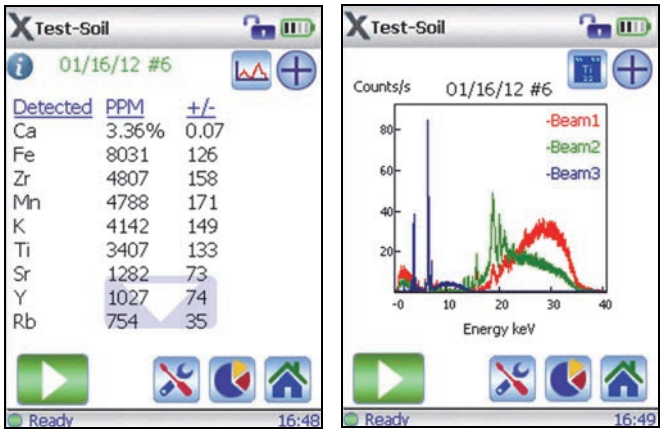


Figure 7-10 Results (chemistry and spectra)

6. At the end of the session, it is a good practice to export the session's results to a PC using the data port and USB cable.

NOTE

See section 8.2 on page 94 for details about the exporting procedure.

7.3 Testing Best Practices

Testing best practices are guidelines for improving test accuracy when testing in various modes.

7.3.1 Alloy Mode

Prior to a test session, you should have an understanding of Olympus's implementation of:

- Grade libraries (see Appendix H on page 141).
- Match issues including the concept and use of match numbers (see section 2.8.1 on page 28).

TESTING TIPS FOR ALLOY MODE

- Place the analyzer's window on/over the test specimen, cover the window completely.
- Take care not to damage the window film, such as when testing "metal turnings" or hot surfaces.

7.3.2 Mining and Soil Modes

Check Standards

- Measure a check standard after each Cal Check, and periodically throughout the day. Test for a recommended minimum of one minute.

- Use the standards provided with the analyzer. Standards are contained in XRF sample cups. These containers have a window (through which the soil can be viewed) on one side, and a solid cap on the other side.

NOTE

Always measure samples through the sample cup's window.

Sample Presentation

***In situ* testing**

In situ testing is performed by pointing the analyzer at the ground. Clear any grass or large rocks away and hold the analyzer with the probe head front flush to the ground. Since dirt can accumulate on the analyzer window, gently wipe the window clean after each analysis. Ensure the window is not ripped or punctured.

Bagged or prepared sample testing

Analyze prepared samples in a sample cup, through its window. Place the analyzer's measurement window directly over the sample cup with the film side up. Preparation considerations include:

- Avoid measuring very thin samples, as this can affect results. Prepare samples cups to contain at least 15 mm (usually 4 to 8 grams) of packed samples.
- When analyzing bagged samples, make sure that there is sufficient sample material in the bag to create a sample thickness of a minimum of 15 mm and that the sample area covers the analyzer's measurement window.
- When using bags, cheaper bags (having thinner plastic walls) are better than more expensive ones (which have thicker plastic walls).

TESTING TIPS FOR MINING AND SOIL MODES

- Place the analyzer's measurement window directly over the sample cup with the film side up.
- Specify the altitude or atmospheric pressure to gain increased accuracy for light elements.
- Confirm that the testing time and other parameters are properly selected.
- Take care not to damage the window film, such as when testing uneven surfaces.

7.3.3 Consumer Mode (RoHS)

Check Standards

Measure a check standard after each Cal Check, and periodically throughout the day. Two certified standards are provided for verification.

- At least one standard should be measured for a minimum of two minutes.
- Standards provided are contained in XRF sample cups with a window (through which the plastic pellets can be viewed) on one side, and a solid cap on the other side.
- Samples should be measured in the sample cup, through the window.

Sample Presentation

Since many samples analyzed for RoHS compliance are very small, such as surface mount components, take care to measure them in a safe and accurate manner.

Refer to the IEC 62321 recommendation for minimum thickness of test samples.

Tips For Consumer Mode (RoHS)

In order for XRF testing to be quantitative:

- Use homogeneous samples.
- Make sure samples are of a minimum thickness:
  - 5 mm for polymers and light alloys.
  - 15 mm for liquid samples.
  - 1 mm for other alloys.

If samples are heterogeneous, too thin, or too small, only qualitative screening is possible.

8. Results

Each test result is individually stored as a record in the DELTA handheld XRF analyzer. A single result or set of results can be easily found, formatted, and displayed in the **Results** screen. Results can also be exported or averaged (see Appendix C on page 115 for more information).

8.1 Using the Results Screen

The **Results** screen allows you to view current test results, navigate to stored results, and export results (see Figure 8-1 on page 91).

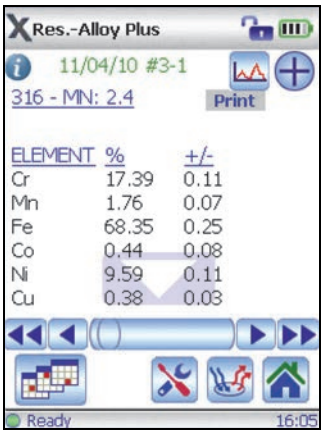


Figure 8-1 Results screen

The calendar allows you to quickly navigate by date through test sets.

To use the calendar

1. In the **Home** screen or **Test** screen, tap the Results button ( ).
2. In the **Results** screen, tap the Calendar button ( ) to display the **Results Summary** screen (see Figure 8-2 on page 92).
3. Double-tap a year to display the months.
4. Double-tap a month to display the days.
5. Tap a day, and then tap **Go To Result** to display the selected result.

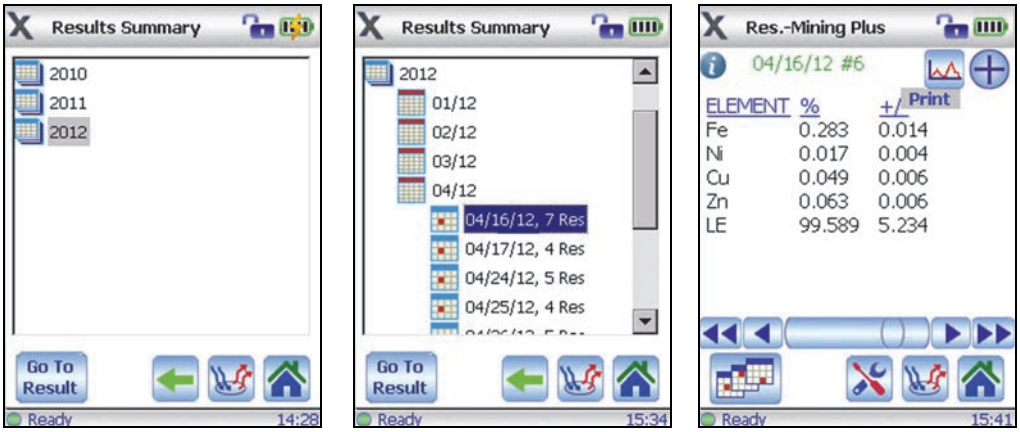


Figure 8-2 Results Summary screens — Using the calendar

The scroll bar and arrows allow you to scroll through test sets or individual tests.

To use the scroll bar and arrows

1. Tap the horizontal scroll bar.
   It immediately enlarges (see Figure 8-3 on page 92).
2. Tap in any other area of the screen, and the scroll bar shrinks to its original size.
3. Use the scroll bar to scroll through the test records in a particular set.
4. Use the single arrows to navigate record-by-record through all the stored records.
5. Use the double arrows to navigate through sets of records.

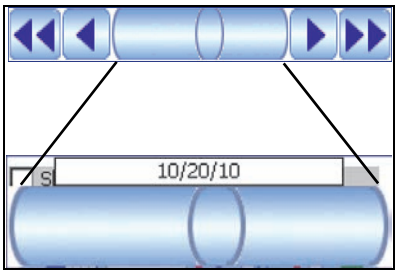


Figure 8-3 Horizontal scroll bar

To set the display options

1. To expand the display. tap the Plus button ( ).
2. To return the display to normal, tap the Minus button ( ).
3. For the spectral display, tap the Spectral Plot button ( ).
4. To display the elemental chemistry, tap the Chemistry button ( ).
5. To display messages, tap the Info button ( ).

6. Tap the Back button ( ) to return to the main **Results** display.

You can set up the display of Results or export information.

To set up results information

1. In the **Results** screen, tap the Tools button ( ) to display the **Setup** screen (see Figure 8-4 on page 93).

NOTE

See section 6.3 on page 75 for instructions for setting up the display information (**Element Display Order** and display areas).

---

2. To view the complete **Element Display Order** area, tap the Plus button.

Figure 8-4 Setup *(left)* and Results *(right)* screens

To configure Label Defaults (Test labeling)

- In the **Setup** screen, tap **Label Defaults** (see Figure 8-4 on page 93).

NOTE

See section 6.2 on page 69 for instructions for setting up test labels.

To setup historical averaging

- In the **Setup** screen, tap the Averaging button ( ) to display the Historical Averaging screen.

  See Appendix C on page 115 for instructions on setting up historical averaging.

To print the results information

- In the **Setup** screen, tap the Printer button ( ) to print to a Bluetooth® enabled printer.

NOTE

The DELTA analyzer must be paired with a Bluetooth enabled printer (see section 1.8 on page 15).

8.2 Exporting Results Information

Results records are grouped by date. An individual result recorded on a particular day cannot be exported to a file or deleted. Only results for an entire day, multiple days, or for a selected mode can be exported or deleted.

To export results

1. In the **Setup** screen, tap **Export**.
2. In the **Export** screen, select **Results** or **Spectra** as the default result display (see Figure 8-5 on page 95).
3. In the **Filter** list, select a mode.

   The results list displays only records (grouped by date) which were created in the selected mode.
4. To further select records by date for export, tap on that date.

   All the records for that date are exported. You can also use the **Select All** or **Select None** button.
5. Select the **Include Image** check box to include any associated images.
6. Select **Autoname** or **Prompt** to determine how the exported file is named.

   If you select **Prompt**, you will be prompted for a file name at the time the file is exported.
7. Select the **Use SN in file name** check box to include the analyzer serial number in the file name.
8. Select the **Auto Export** check box to automatically export each result recorded.
9. Tap the Export button ( ) to export the results (see Figure 8-5 on page 95).

Figure 8-5 Export screen

To delete a record set

1. In the **Export** screen, select a mode (or **All**).
2. In the results list, select one or more record sets (listed by date).
   You can also use the **Select All** button to select all record sets for the selected mode.
3. Select the **Delete** check box (see Figure 8-6 on page 95).
   The Export button ( ) becomes the **Delete** button.
4. Tap **Delete**, and then tap **Yes** in the confirmation dialog box (see Figure 8-6 on page 95).

Figure 8-6 Delete screen

8.2.1 Export options

To select parameters for export

1. In the **Export** screen, tap the Tools button ( ) to display the **Export Options** screen (see Figure 8-7 on page 96).
2. In the template list, select a template name.

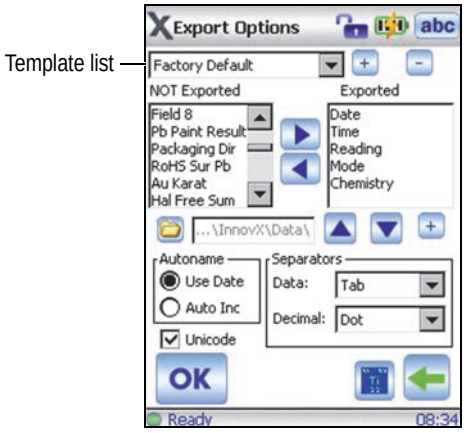


Figure 8-7 Export Options screen

3. Select parameters in the **NOT Exported** list, then tap the **Right** arrow ( ) to move them to the **Exported** list.

   Alternatively, move parameters to the **NOT Exported** list using the **Left** arrow ( ).

   Table 6 on page 96 lists the parameters that can be exported.
4. To move one or more items up or down in the **Exported** list, select the item(s) and then tap the up or down arrow (/) located below the list.
5. In the **Autoname** area, select **Use Date** or **Auto Inc** (increment).
6. In the **Separators** area, select whether you want the exported data to be **Tab**, **Comma**, or **Semicolon** delimited; and whether you want a decimal to be represented by a **Dot** or a **Comma**.
7. Select the **Unicode** check box to encode the exported text as Unicode.
8. Specify the export directory:
   a) Tap the Folder button to display the **Specify Export Directory** screen.
   b) Enter the export directory, and then tap **Save**.

Table 6 Default list of exportable parameters

2nd Match	Field 5
2nd Match Num	Field 6
3rd Match	Field 7
3rd Match Num	Field 8
Ambient Pressure	Hal Free Sum
Au Coating	Instrument Info
Au Karat	Live Time
Best Match	LOD Sigma
Best Match Num	Method name
Cal Check info	Mode
Chemistry	Pass/Fail
Collimated	Packaging Dir
Date	Pb Paint Result

Table 6 Default list of exportable parameters *(continued)*

Elapsed Time	Reading
Field 1	RoHS Sur Pb
Field 2	Time
Field 3	Unit
Field 4	User Factor Name

To add a new template

1. In the **Export Options** screen, tap the Plus button ( ) at the top of the screen to display the **Add Export Template** screen (see Figure 8-8 on page 97).
2. Enter a template name in the box, and then tap **Save** to return to the **Export Options** screen.

   The new template name is displayed in the **Export Options** screen.

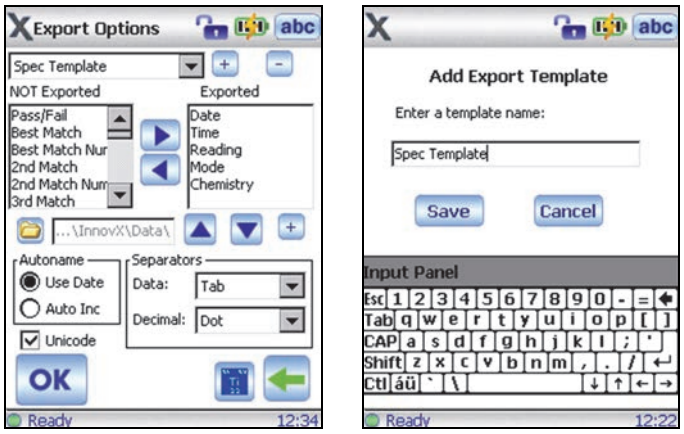


Figure 8-8 Export Options *(left)* and Add Export Template *(right)* screens

To delete a template

1. In the **Export Options** screen, select a template, then tap the Minus button ( ).
2. In the dialog box, tap **OK**.

To define a new parameter for export

1. Tap the Plus button below the **Exported** list.
2. In the **Add User Column** screen (see Figure 8-9 on page 98), enter a name in the **Column Name** box.
3. Tap **Save** to dismiss the **Add User Column** screen and see the parameter in the **Exported** list. The default list of parameters that can be exported is shown in Table 6 on page 96.

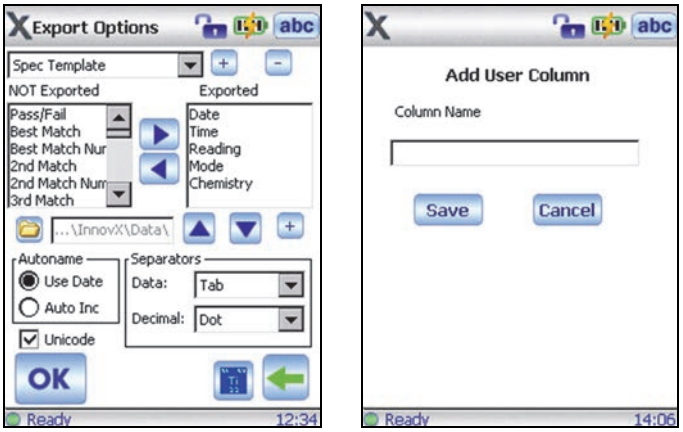


Figure 8-9 Export Options *(left)* and Add User Column *(right)* screens

To select chemical data for export

1. In the **Export Options** screen, tap the Chemistry button ( ) to display the export chemical options screen (see Figure 8-10 on page 99).
2. To list every possible element to export, select **Show more**.
3. Select elements and move them from the list under **Show more** to the **Export Order** list using the right arrow ( ). These are the elements that are exported.

   The double arrows (/) move all the items from one list to the other.
4. To move one or more items up or down in the **Export Order** list, tap the item(s) and then tap the up or down arrow (/).
5. Select a **Level Option**:
   - **Detected**

     In the exported file, displays **ND** (non-detect) in the result column for all non-detects, and leaves the +/- column blank.
   - **Detected + LOD**

     Displays <LOD in the result column and the estimated LOD (limit of detection) calculation in the +/- column.
   - **Chem < LOD**

     Displays a calculated result and error even when the result is less than the limit of detection for that particular analysis. This option is mainly for advanced users.
6. Select an **Element/Compound**:
   - **Element Only**
   - **Compound Only**
   - **Both**.
7. Select **Units** of measure:
   - **Default**
   - **Percent**
   - **PPM**
   - **Mixed**.

8. Choose to **Include**:
   - **Errors**
   - **Pass/Fail**.
9. Select how the elemental information is exported:
   - **Auto Include**
   - **Auto Exclude**
   - **Nominal Chem**.

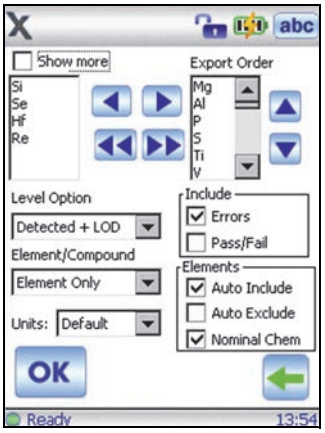


Figure 8-10 Export chemical options screen

10. Tap **OK** to save and return to the **Export Options** screen (see Figure 8-7 on page 96).
11. Tap **OK** again to return to the **Export** screen (see Figure 8-5 on page 95).
12. Tap the Export button ( ) to export the results.
13. In the **Export Data** dialog box, enter a file name, and then tap **OK**.

8.3 Trending

Trending allows you to compare and display the analytical accuracy of individual elements across multiple test results.

8.3.1 Setting up trending

To set up basic trending

1. In the **Results** screen, tap the Tools button ( ) to display the **Setup** screen.
2. Tap **Trending** to display the trending template select screen (see Figure 8-11 on page 100). If no template is defined, trending is disabled, and "Trending Disabled" is displayed.
3. To define a new template name, tap the Plus button ( ) to display the Add Trending Template screen (see Figure 8-12 on page 100).

Figure 8-11 Setup *(left)* and trending template select *(right)* screens

4. Enter a template name, and then tap **Save** to save and display the template setup screen (see Figure 8-12 on page 100).

   In the template setup screen, the current template name is displayed in the list box at the top of the screen.

   You can define new templates or delete the currently selected template using the Plus and Minus buttons.
5. In the **Graph Option** area, leave **Test Number** selected, or select a **Test Label**.

   This information will be used as the X-axis of the trending graph.
6. Select elements and move them between the **Excluded** and **Included** lists using the arrows.

   The elements in the **Included** list are used when the trending graph is displayed.

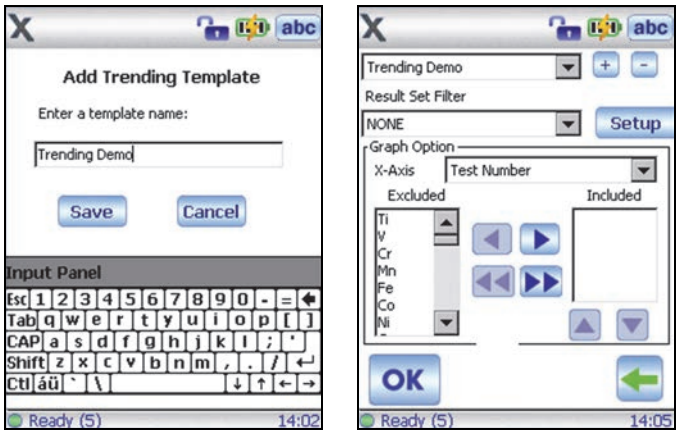


Figure 8-12 Add Trending Template *(left)* and template setup *(right)* screens

It is not necessary to configure results filters. However, if filters are not configured, the trending graph will contain results for all modes and all dates that are currently on the analyzer. To provide more specific graphs, it is best to define filters that use a single mode, one or more test labels, or specific dates.

To configure a results filter

1. To add a **Result Set Filter**, tap **Setup** (see Figure 8-12 on page 100) to display the filter setup screen (see Figure 8-13 on page 101).

   The **Result Set Filter** list shows the current filter. If no filters are selected, **NONE** is displayed.

2. Tap the Plus button (+) to display the **Add Result Filter Template** screen (see Figure 8-13 on page 101).
3. Enter the filter name, and then tap **Save** to display the filter configuration screen (see Figure 8-13 on page 101).

   The current filter name is displayed at the top of the screen.

   You can define new filter or delete the currently selected filter using the Plus and Minus buttons.
4. In the **Mode** list, select a mode.

   The two lists below the **Mode** list allow you to configure one of eight test labels. These are not normally used, but can be configured to provide more granular filtering. If test labels are used, the value of the selected label must be must be entered in the adjacent field.
5. To set a date range for the trending graph, tap the down arrow, and then enter a date using the pop-up calendar.

   You can quickly select a year by clicking on the year (at the top of the calendar) and using the spin box. Navigate to a month by clicking on the month and selecting from the menu.

Figure 8-13 Filter setup *(left)*, Add Result Filter Template *(middle)*, and filter configuration *(right)* screens

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NOTE

When the date filter is set, all tests run during that date range are included in the trending analysis. You cannot include or exclude any particular test results for a given date range.

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6. Click **OK** to return to the template setup screen (see Figure 8-14 on page 102).

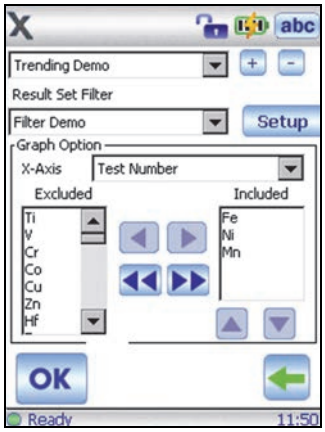


Figure 8-14 Template setup screen

7. Click **OK** again to return to the **Setup** screen.
8. Click **OK** once more to return to the **Results** screen.

Appendix A: Graphic Elements

A.1 Home

The DELTA user interface is centered around the **Home** screen. It displays four buttons (**Mode**, **Test**, **Results**, **Setup**) which control access for managing the entire Olympus DELTA XRF application (see Figure A-1 on page 103).

Figure A-1 Home screen

A.2 Graphic Elements

The graphic elements of the user interface are presented in Table 7 on page 103 and Table 8 on page 105.

Table 7 Buttons and indicators

Graphic element	Name	Description	Graphic element	Name	Description
	Home	Return to UI main screen. Then direct access to **Setup**, **Mode**, **Test**, and **Results** buttons.		Setup	System-wide setup including Trigger Hardware, Printer, BT GPS, Users, Date-Time, Exit.

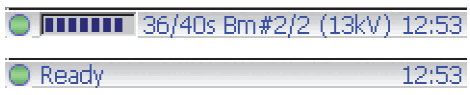
Table 7 Buttons and indicators *(continued)*

Graphic element	Name	Description	Graphic element	Name	Description
	Mode	Shows available modes; allows mode selection.		Test	Go to **Test** screen (see chapter 3 on page 43 for details).
	Tools	Go to **Test Setup**; set testing times; repeats, Cal Check, label defaults; custom display.		Results	Go to the **Results** screen.
	Test/Tools	Shortcut from **Test Conditions** to **Test Setup**.		Calendar	Access to result navigation facility.
	Cal Check	Perform Cal Check procedure.		Spectral Plot	Go to spectral plot of current elemental test.
	Start Test	Start a test; clear previous screen; show status.		Chemistry	Go to elemental list from the current spectral plot view; A toggle with Spectral plot.
	Stop Test	Stop current test immediately; return to ready status.		Back	Return (without saving) to previous screen.
	Exit	Leave DELTA software with confirm		OK	Return to previous screen; save any new data.
	Lock	Trigger is locked by: (a) software control or (b) manual override.		Print	Used on **Test** and **Results** screens.
	Unlock	Trigger is not currently locked. Trigger may be pulled to allow X-rays to be emitted.		Camera	Display of last saved image.
	Maximize Display	Expands either the list or spectral plot displays.		Live Video	Real-time display from camera.
	Minimize Display	Returns list or spectral plot displays to original layout.		Display Keyboard	Data entry toggle function; provides access to or removes **Input Panel**.

Table 7 Buttons and indicators *(continued)*

Graphic element	Name	Description	Graphic element	Name	Description
	Zoom/ Unzoom	Used with spectral plots to focus on narrower ranges.		Battery	Black bars give graphic indication of battery charge status.
	Info	Provides access to test label data and entry.		Restart	Restarts the operating system (OS) and analyzer software.
	Message	System message in error log.		Battery	Solid red is indicator of low battery charge status.
	Message	Error message in error log.		Battery	AC power is installed and its power supply is on.
	Export	Send the chosen set of results to output device.		Admin Prefs	Enables users with a password to set certain preferences.
	Averaging	Averaging enabled.		Trending	Enables display of trending data.
	Print to Bluetooth®	Prints results to a Bluetooth-enabled printer.		Test Selected	Indicates test is selected for averaging.
	Select Test	Indicates current test can be added to the averaging set.		Power OFF	Shuts the analyzer down

Table 8 User interface graphics

DELTA screen displays key information via upper and lower status bars	
Upper status bar displays: • Current operation and mode • Trigger status (locked or unlocked) • Battery charge status	
Lower status and message bar displays: • Test progress and system information • System status and system time	

Appendix B: Camera and Collimator

Olympus DELTA handheld XRF analyzers are available with a camera and collimator as factory installed options.

B.1 Camera

The camera shows the area where the X-ray beam is focused.

To set up the camera

1. In the **Test Setup** screen, tap **Camera** to display the **Camera Setup** screen (see Figure B-1 on page 107).
2. In the **Camera Enable** area, select **On**.
3. In the **Camera LED** area, select **On** or **Off**.
   This controls the internal LED light which illuminates a section of the test sample.

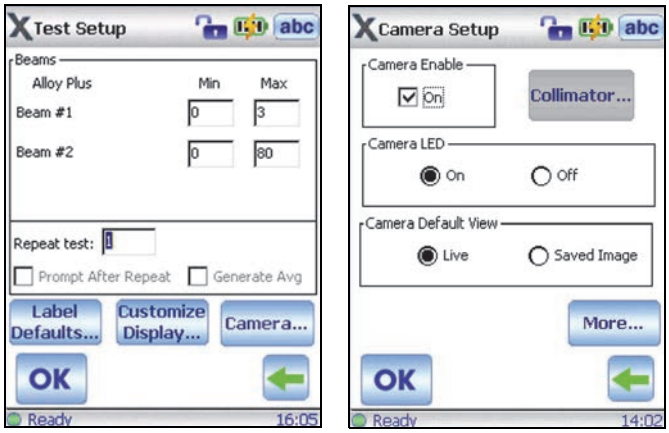


Figure B-1 Test Setup *(left)* and Camera Setup *(right)* screens

4. In the **Camera Default View** area, select **Live** or **Saved Image**.
   This selects what will be displayed on the **Test** screen during testing. An indicator near the top of the **Test** screen indicates which view is current (see Table 9 on page 108).

Table 9 Camera display selection

Indicator	Camera View
	Live View The **Test** screen continuously displays the live camera image of the object in front of the analyzer window.
	Saved Image View The **Test** screen displays the last captured image.

5. Tap **More** (see Figure B-1 on page 107) to access a second **Camera Setup** screen.
6. To get one image for each repeated test, select the **One Image Per Each Repeated Test** check box.

   Otherwise only one image is generated for an entire series of repeated tests.
7. To adjust the **Camera LED Brightness**, tap and hold the slider, and then move it side to side.

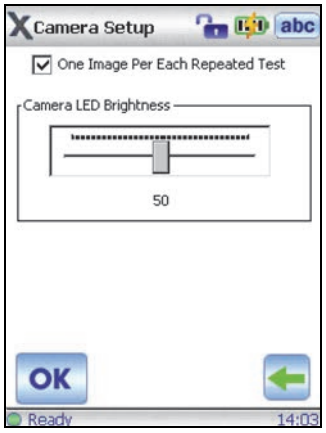


Figure B-2 Camera Setup screen (second page)

8. Tap **OK** three times to save your settings and go back through the previous three screens to the **Test** screen (see Figure B-3 on page 109).

   You are now ready to use the camera.

Figure B-3 Test screen — Camera enabled

B.2 Collimator

The collimator focuses the normal 10 millimeter beam spot diameter down to 3 millimeters. This enables you to target a smaller area of a sample for testing.

NOTE

The collimator is a factory option available on DELTA handheld XRF analyzers equipped with a camera. Collimation is not available in Filter, Lead Paint, Dust Wipe, and Halogen Free modes.

Collimator Set Up

Setting up the collimator includes setting the cursor position, then cropping the image. Setting the cursor position aligns the camera cursor with the collimated X-ray beam spot.

Cropping refers to the removal of the outer parts of an image. This has the effect of zooming in on a particular area. When a test is run using the collimator, the cropped image is always shown on the screen.

Olympus provides a two-sided collimation test coin (P/N: 103281 [U8996829]) as a check sample with all collimated DELTA analyzers:

- Side 1 has phosphor paper embedded and is used to set the cursor position (see Figure B-4 on page 110).

Figure B-4 Collimation test coin — Side 1

- Side 2 has varying sizes of copper (Cu) circles containing solder in a field of bromine-containing plastic (Br). It is used to verify the X-ray beam spot location (see Figure B-5 on page 110).

Figure B-5 Collimation test coin — Side 2

Since collimated beams have a spot diameter of approximately 3 mm, the test coin is used to verify collimation of the beam. This is done by using side 1 of the test coin to set the cursor position, then using side 2 to test and compare the ratio of Cu to Br.

For example, a properly positioned collimated beam focused on the 4 mm test sample should test 100 % Cu. The same collimated beam focused on the 1.5 mm test sample should test 50 % Cu and 50 % Br.

To display the Collimator Setup screen

1. In the **Test Setup** screen, tap **Camera/Collim**.

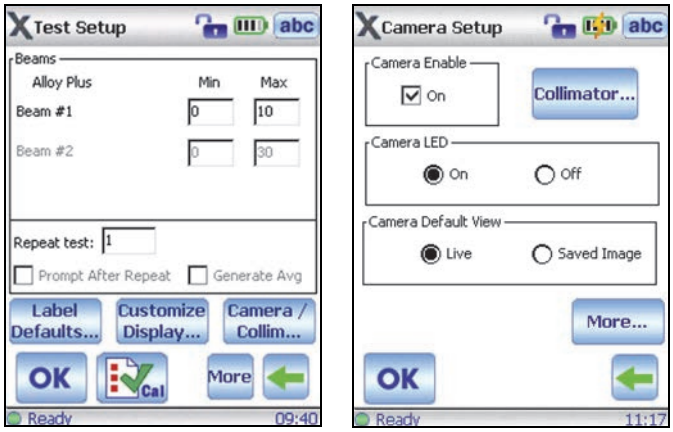


Figure B-6 Test Setup *(left)* and Camera Setup *(right)* screens

2. In the **Camera Setup** screen (see Figure B-6 on page 111), tap **Collimator** to display the **Collimator Setup** screen (see Figure B-7 on page 111).

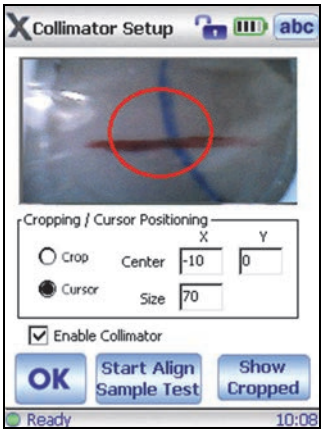


Figure B-7 Collimator Setup screen

To set the cursor position

WARNING

To avoid potential radiation exposure:

- Do not point the analyzer at yourself or another person when testing.
- Do not hold a sample with your fingers or in the palm of your hand when testing.
- Always wear both a ring-style and a badge (either clip-on or lanyard-style) dosimeter.

1. In the **Collimator Setup** screen, select the **Enable Collimator** check box (see Figure B-7 on page 111).
2. In the **Cropping / Cursor Positioning** area, select **Cursor**.

3. Tap **Start Align Sample Test**.

   A dialog box appears, requesting: "Please put X-ray Phosphor sample in front of window."
4. Place the analyzer on side 1 of the collimation test coin, and then tap **OK**.

   As the analyzer emits X-rays, the phosphor paper on the test coin glows to indicate the X-ray beam spot.
5. Tap the center of the X-ray beam spot to align the cursor (the red circle) with the beam spot.
6. When satisfied with the position of the cursor, tap **Stop Test**.
7. Click **OK**.

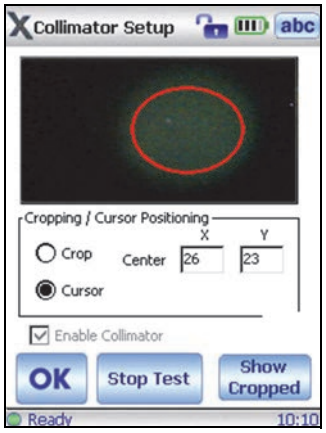


Figure B-8 Collimator Setup screen — Cursor aligned with beam spot

To crop the image

1. Place the analyzer on one of the copper circles (side 2 of the collimation test coin).
2. In the **Collimator Setup** screen (see Figure B-9 on page 113), select **Crop** in the **Cropping / Cursor Positioning** area.
3. Tap and drag your finger diagonally across the portion of the image you want to keep.

NOTE

The screen takes several seconds to update after you select an area of the image for cropping.

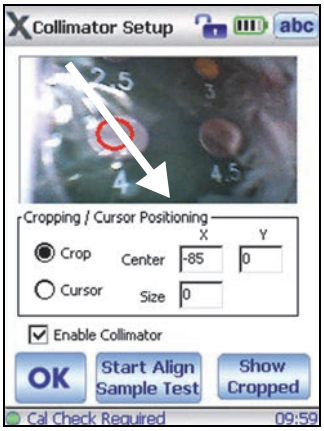


Figure B-9 Collimator Setup screen — Tap and drag

4. To adjust the size of the display image, enter values into the **Size**, **X**, or **Y** boxes. Figure B-10 on page 113 shows a rectangle indicating the cropped area.

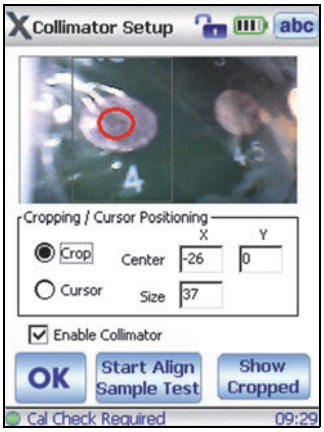


Figure B-10 Collimator Setup screen — Cropped area defined

5. Tap **Show Cropped** (see Figure B-11 on page 114) to view the cropped image.
6. Tap **Show Un-Cropped** to view the uncropped image.

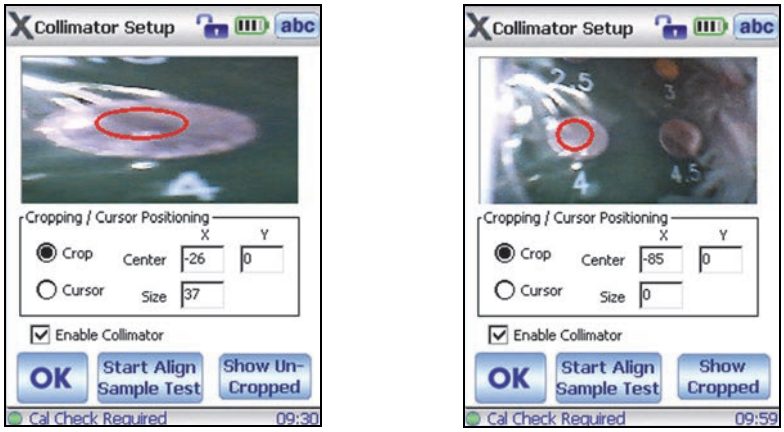


Figure B-11 Collimator Setup screen — Cropped/Uncropped views

NOTE

When a test is run using the collimator, the cropped image is the default display.

Appendix C: Averaging Test Results

The DELTA handheld XRF analyzer is capable of finding the average of multiple tests. There are three types of averaging available:

- Live averaging
- Historical averaging.
- Repeated tests with averaging

C.1 Live Averaging

Live averaging allows you to run tests, and also create an average using selected multiple tests.

To enable live averaging

1. In the **Setup** screen (see Figure C-1 on page 115), tap **Admin Prefs** to display the password screen.
2. Tap in the **Password** box, and then enter the password using the **Input Panel** (see Figure C-1 on page 115).

   Default password is **z** (lower case).
3. If necessary, tap the Display Keyboard button (**abc**) to dismiss the **Input Panel**.
4. Tap **OK** to display the preference selection screen.

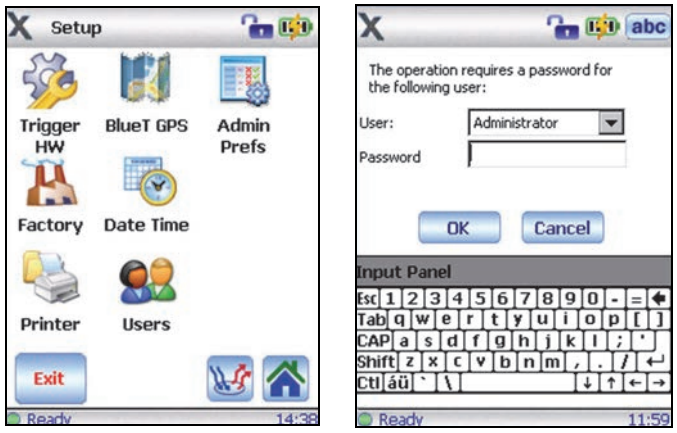


Figure C-1 Setup *(left)* and password *(right)* screens — Input Panel

5. In the preference selection screen (see Figure C-2 on page 116), select **Live Averaging**.

6. Tap **Back** to save your choice and return to the **Setup** screen.

Figure C-2 Preference selection screen

7. Tap the Home button ( ) to display the **Home** screen.

To setup live averaging

1. In the **Home** screen, tap the Test button ( ) to display the **Test** screen for the mode (see Figure C-3 on page 116).
2. Tap the Averaging ( ) button to display the **Average Live Setup** dialog box (see Figure C-3 on page 116).
3. Select **Manual Stop** (see Figure C-3 on page 116).
4. Tap **OK**.

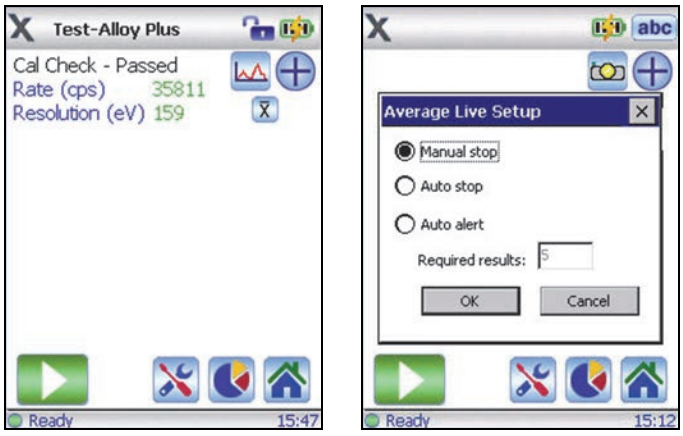


Figure C-3 Test screen — Averaging button and Average Live Setup dialog box

The Averaging button is now red, indicating that live averaging is active (see Figure C-4 on page 117).

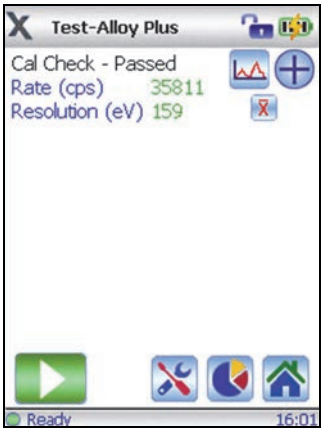


Figure C-4 Test screen — Live Averaging enabled

To use live averaging

WARNING

To avoid potential radiation exposure:

- Do not point the analyzer at yourself or another person when testing.
- Do not hold a sample with your fingers or in the palm of your hand when testing.
- Always wear both a ring-style and a badge (either clip-on or lanyard-style) dosimeter.

1. Place the DELTA analyzer on the test sample, and then pull the trigger to initiate a test. When the test is finished, a gray check button is displayed (beside the Averaging button ( ) to indicate that the most recent test is available for averaging (see Figure C-5 on page 118).
2. Tap the gray check button ( ) to include the most recent test in the averaging group.

   The check turns green ( ) to confirm, and the status bar at the bottom of the screen displays **Ready-mark (1)** to indicate that one test has been designated for averaging.

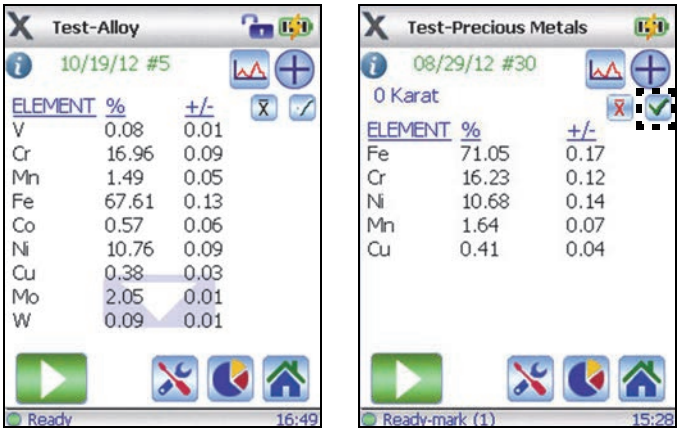


Figure C-5 Test screen — Current test selected

3. Pull the trigger again to initiate another test.

   When the test is finished, the green check button indicates that the most recent test has been designated for the averaging group. The status bar at the bottom of the screen displays **Ready-mark (2)** to indicate that two tests has been designated for averaging
4. Pull the trigger again to initiate a third test.
5. When the test is finished, tap the green check button to deselect.

   The check turns gray, the most recent test is not designated for the averaging group, and the status bar displays **Ready-mark (2)**.
6. Pull the trigger again to initiate a fourth test.

   At the end of the test, the check button is green, and the status bar displays **Ready-mark (3)**.
7. Tap the Averaging button ($\bar{X}$) to create the average and display the data (see Figure C-6 on page 118).

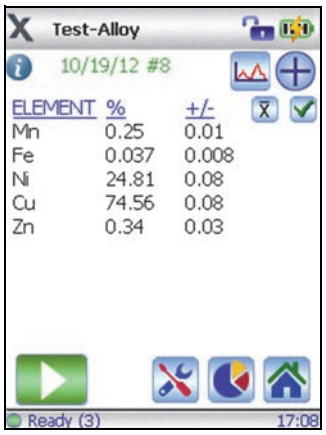


Figure C-6 Test screen — Live averaging results

C.2 Historical Averaging

Historical averaging allows you to select from a list of previous test results, then create an average from your selections.

To enable historical averaging

1. Perform steps 1 to 3 in “To enable live averaging” on page 115.
2. Select **Historical averaging**.
3. Tap **Back** to save your choice and go back to the **Setup** screen.
4. Tap the Home button to display the **Home** screen.

To setup and use historical averaging

1. In the **Home** screen, tap the Results button ( ) to display the **Results** screen for the mode.

   A gray check button appears for every valid test result (see Figure C-7 on page 119).

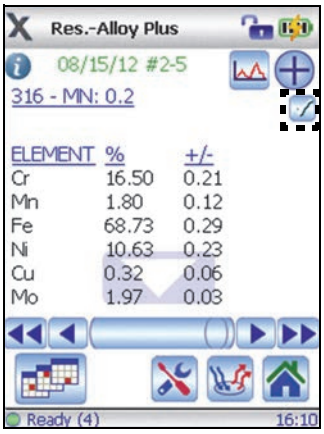


Figure C-7 Results screen — Historical averaging available

2. Tap the check button ( ) to include the result in the averaging group.

   The check turns green to confirm the test is included. **Ready (1)** in the status bar at the bottom of the screen indicates that one test has been designated for averaging.
3. Select as many results as necessary. Use the arrows, scroll bar, and calendar to locate a particular result.
4. Tap the Tools button to display the **Setup** screen (see Figure C-8 on page 120).

Figure C-8 Setup screen

5. Tap the Averaging button ($\bar{X}$) to view the tests selected for averaging (Figure C-9 on page 120).
6. Tap **Calc Average** to calculate the average and display the confirmation screen.

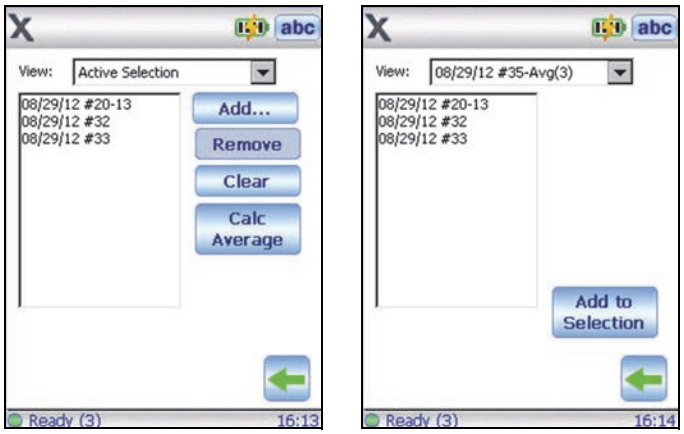


Figure C-9 Results — Historical averaging selection and confirmation screens

7. Tap **Add to Selection**, and then tap the Back arrow twice.
   The averaged result should be visible on the **Results** screen (see Figure C-10 on page 121).

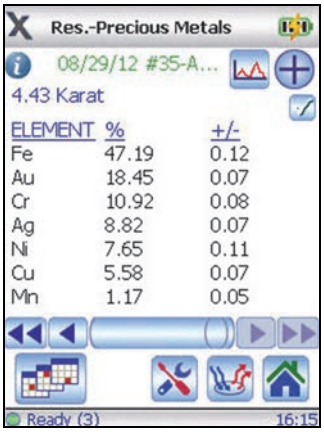


Figure C-10 Results screen — Historical average displayed

To add additional results to an average set

1. Select an individual result, and then tap the check button to include the result in the averaging group. Select as many individual results as you want.
2. Tap the Tools button to display the **Setup** screen (see Figure C-11 on page 121).
3. Tap the Averaging button ($\bar{X}$) to see the original averaging set with the new additions (see Figure C-11 on page 121).

Figure C-11 Setup screen and results — Historical selection screen

4. Tap **Calc Average**.
5. Tap **Add to Selection**, and then tap the Back arrow twice.
   The averaged result should be visible on the **Results** screen.

To add batch results to an average set

1. Select an individual result, and then tap the check button.
2. Tap the Tools button to display the **Setup** screen (see Figure C-8 on page 120).

3. Tap the Averaging button ($\bar{X}$) to see the **Active Selection** you just chose (see Figure C-12 on page 122).
4. Tap **Add** to display the **Add Results** dialog box.
5. In the **Number to add** box, enter a value.
6. Select **Newer** to add newer results, **Older** to add older test results.
7. Tap **OK**.
   The specified number of newer or older test results are added to the initial result.

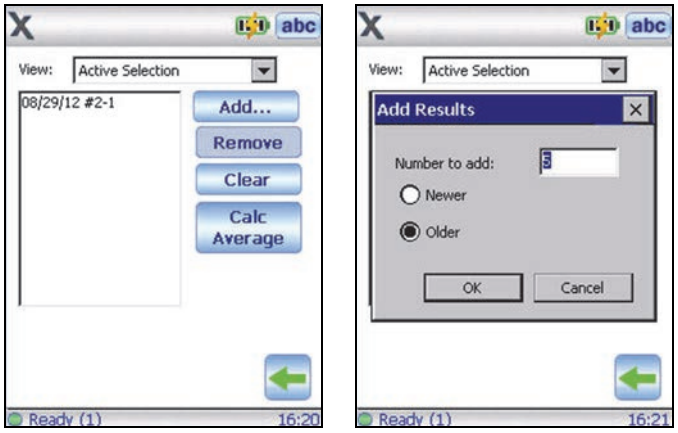


Figure C-12 Results — Historical selection screens

8. Tap **Calc Average**.
9. Tap **Add to Selection**, and then tap the Back arrow twice.
   The averaged result should be visible on the **Results** screen (see Figure C-13 on page 122).

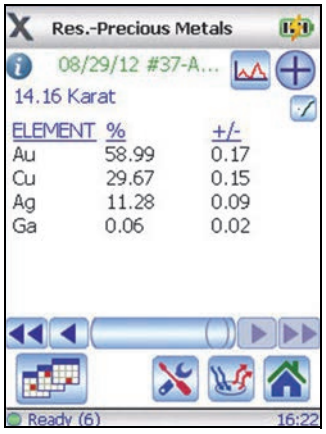


Figure C-13 Results screen — Batch average displayed

C.3 Repeated Tests With Averaging

NOTE

Live averaging must be disabled in **Setup > Admin Prefs** before repeated tests with averaging can be run.

When repeated tests with averaging is enabled, the test is repeated the configured number of times. Then the DELTA software automatically creates an average using every test in the sequence to calculate the average.

Example:

```
2-1, 2-2, 2-3, 2-4, 2-5, 2-Ave
```

In the example sequence above, test number 2 (first digit) was repeated 5 times (second digit), then the average of the five tests was calculated.

To generate repeated tests with averaging

WARNING

To avoid potential radiation exposure:

- Do not point the analyzer at yourself or another person when testing.
- Do not hold a sample with your fingers or in the palm of your hand when testing.
- Always wear both a ring-style and a badge (either clip-on or lanyard-style) dosimeter.

1. In the **Home** screen, tap the Test button ( ).
2. In the **Test** screen, tap the Tools button ( ).
3. In the **Test Setup** screen (see Figure C-14 on page 124), enter the number of tests in the **Repeat Test** box.
4. Select the **Generate Avg** check box.
5. Tap **OK** to go back to the **Test** screen.
6. Tap the Start Test button ( ) to initiate and repeat a test until the specified number of tests are completed.

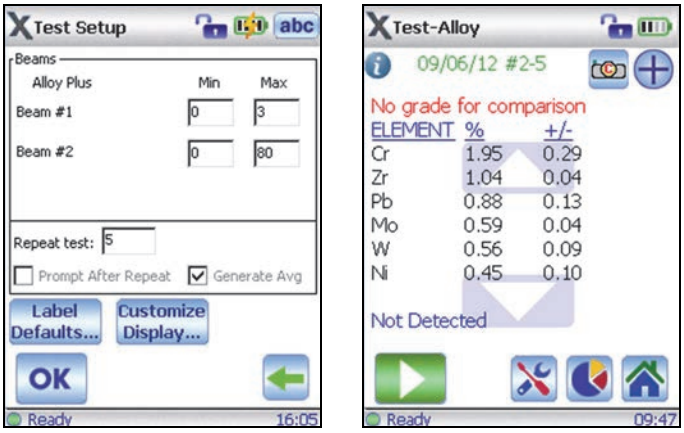


Figure C-14 Test Setup *(left)* and Test *(right)* screens — Test 5 of 5

7. Tap the Results button ( ) to display the average of the repeated tests (see Figure C-15 on page 124).

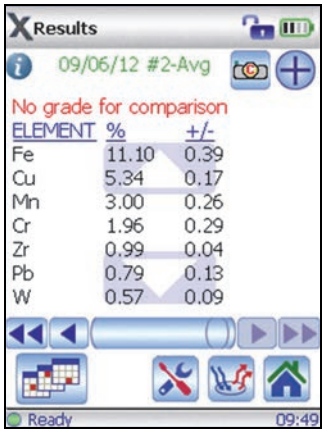


Figure C-15 Results screen — Average of repeated tests

Appendix D: Trending Example

Trending allows you to compare and display the analytical accuracy of individual elements across multiple test results.

Trending always uses existing results, and can be set up before or after the test results have been created. The trending graph is viewed in the **Results** screen. A typical use of trending is described in this section. Note that this is only one example out of a wide range of possibilities:

To perform trending

1. In the mode screen, select a mode (in this example, Soil is selected).
2. Go to the **Test** screen (tap the Test button) and run five tests, preferably on varying concentrations of the target trending element(s).

   (In this example, Ti and Mn are the target elements.)
3. Go to the **Trending Template Setup** screen, and then create a template.
4. Go to the **Filter Configuration** screen, and then create a filter. Select **Soil**, and then use the current day to set the **From** and **To** dates.
5. Select the elements **Ti** and **Mn**.
6. Return to the **Results** screen.
7. Tap the display mode buttons until you get to the Trending button ( ).
8. Tap the Trending button to display the trending graph (see Figure D-1 on page 125).

   The graph shows the legend of the two configured elements, Mn and Ti, on the right. The currently selected element, Mn, is identified in the upper left corner of the graph.

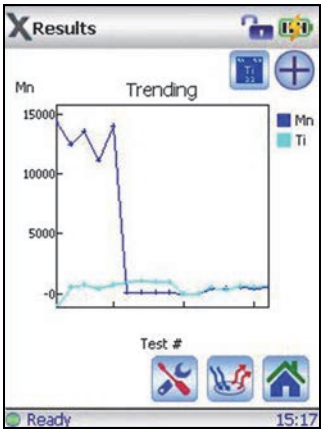


Figure D-1 Trending graph

9. Tap on one of the plots to select that section.

   The selected section disappears, and the detected level, test date, and test number for the section are displayed at the top of the screen, (see Figure D-2 on page 126).

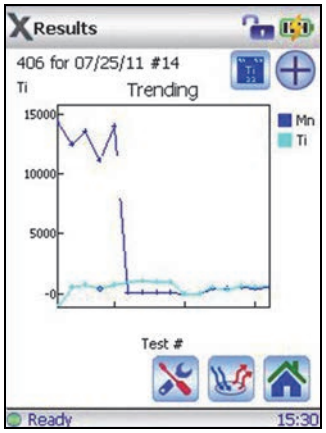
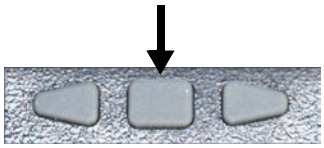


Figure D-2 Trending graph — Plot segment selected

10. To change the selected element, press the middle button on the rear of the analyzer to display a menu (see Figure D-3 on page 126) showing the currently selected element (Ti) and the other element (Mn) available for selection.
11. Select **Mn**.



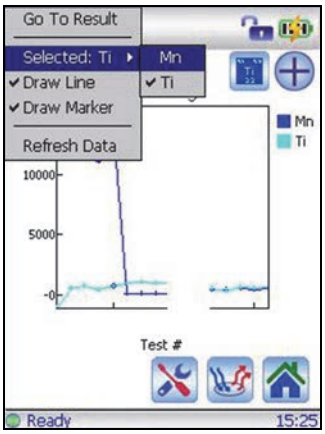


Figure D-3 Trending graph — Middle button menu

12. To zoom in on a sector of the graph, press at a starting point and drag to define the zoom area.

    The magnified segment of the graph is displayed, and the Zoom button ( ) indicates that you are viewing a magnified image (see Figure D-4 on page 127).

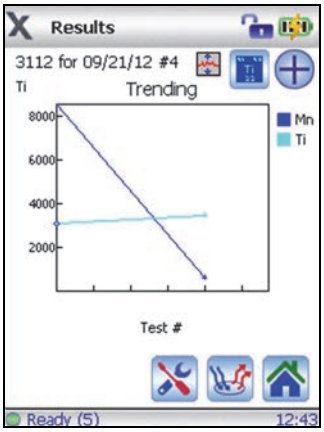


Figure D-4 Trending graph — Magnified view

If using test label filters to create a trending graph of specific tests, you can change the test labels template after gathering the required trending test results for a specific date. The trending data is not altered when additional tests are run.

Appendix E: User Factors

E.1 Definition

User factors are a stored set of scalar multipliers and offsets that are applied directly to factory calibrated results before they are displayed on screen. Therefore, the information on the **Test** screen has been corrected by the user factor. This is typically done to correct for matrix effects.

E.2 Purpose

User factors provide two key benefits:

- Allow you to make linear slope and offset calibration corrections without altering factory calibrations.
- Allow you to store multiple slope and offset calibration factor sets.

E.3 Applicable Modes

User factor correction techniques can be applied for the following modes:

- Mining
- Mining Plus (2-Beam Mining)
- Soil (3-Beam Soil)
- Filter
- Dust Wipe

E.4 Calculating New RoHS/WEEE Factors and Offsets

Prior to accessing the **User Factors** data entry screens:

- Generate the correction factors for the element(s) of interest.
- Use a linear fit equation that is created from elemental assayed values and corresponding XRF results.

The procedure is shown below in the Cadmium example.

Example: Cadmium for Testing in RoHS/WEEE mode

This example shows how to apply user factor techniques to adjust for cadmium in laboratory assayed samples.

1. Gather known assayed Cd samples.
2. Record their assayed values in a three column table
3. Test the corresponding samples with your DELTA handheld XRF analyzer.
4. Record the XRF results in the table. Multiple tests of each sample are recommended.
5. Plot the data using Excel or other data analysis software to create a linear trendline.

See Figure E-1 on page 130 and Table 10 on page 130.

In this example, the XRF data is consistently higher than the assay by about 1.7 times.

From the linear fit equation, the value 0.5888 (say 0.59) is the “factor” that can be multiplied by the XRF result to get a close match to the assayed value.

The offset value (0.1055) is small enough to be disregarded.

Go to section E.5 on page 131 to see the data entry sequence.

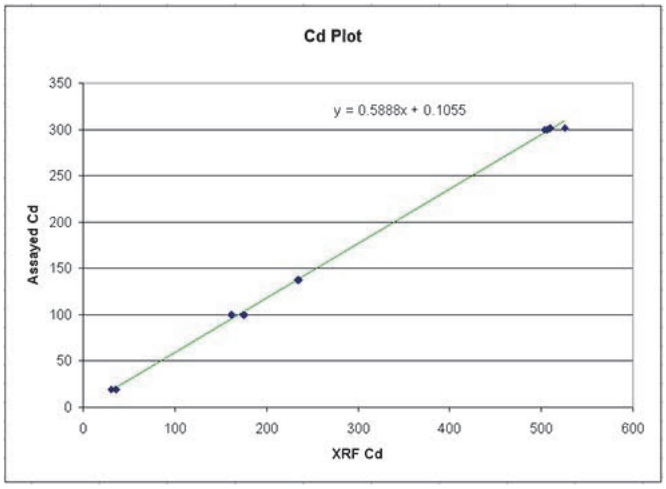


Figure E-1 Sample plot of XRF and assayed values for Cd

Table 10 Sample table of XRF and assayed values for Cd

Sample #	XRF Cd	Assayed Cd
1	31	19.6
1	35	19.6
1	36	19.6
2	236	137
2	235	137

Table 10 Sample table of XRF and assayed values for Cd *(continued)*

Sample #	XRF Cd	Assayed Cd
2	234	137
3	504	300
3	504	300
3	506	300
4	175	100
4	174	100
4	176	100
5	510	301
5	526	301
5	509	301
6	162	100
6	161	100
6	162	100

E.5 Software Operation

Once the factors and offsets (if required) are established, use this sequence to apply them.

To get to user factors

1. From the mode screen, select the correct mode for calibration, and then enter the **Mode Setup** screen (see Figure E-2 on page 132).
2. Tap **Test Conditions**.
3. Tap **User Factor**.

NOTE

RoHS/WEEE mode contains two calibrations, Polymer (beam 1) and Alloy (beam 2). Ensure that the correct one is selected when adding factors.

---

4. For Cd choose **Beam 2** (see Figure E-2 on page 132).

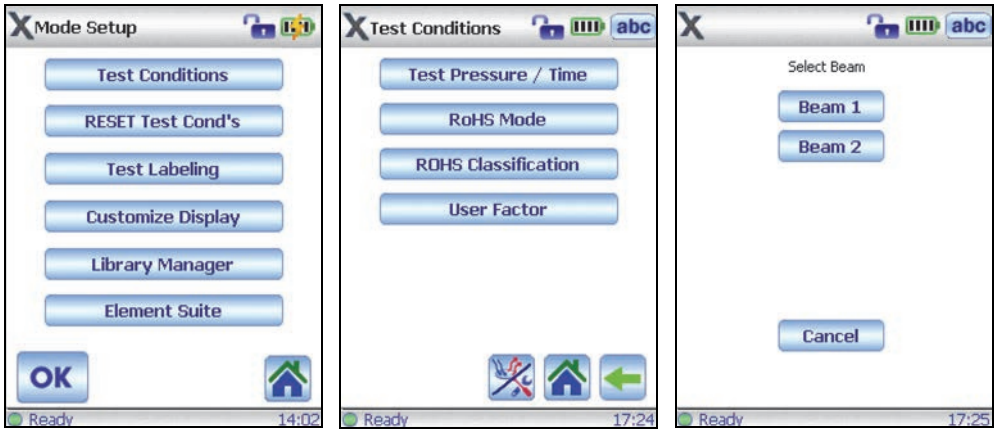


Figure E-2 RoHS mode Select Beam screen

To create a new user factor model

1. In the **User Factors** screen, tap **Create New Model** (see Figure E-3 on page 132).
2. Highlight the new model, and then tap **Change Name**.
3. Enter the new model name with the on-screen keyboard, and then tap **OK**.
4. Scroll to find the element(s) for adjustment, and then enter new factor(s) and offset(s).

TIP

Consider whether offsets are necessary for a given calibration. In many cases, only adjustment of user factor is needed.

To determine an offset, use a minimum of three separate standards, and ensure that the lowest concentration value is <20 % of the highest concentration value.

A user factor plot can also be produced by placing assay results on the X-axis and XRF results on the Y-axis. Make sure that the plot slope and offset are correctly converted to Slope and Offset.

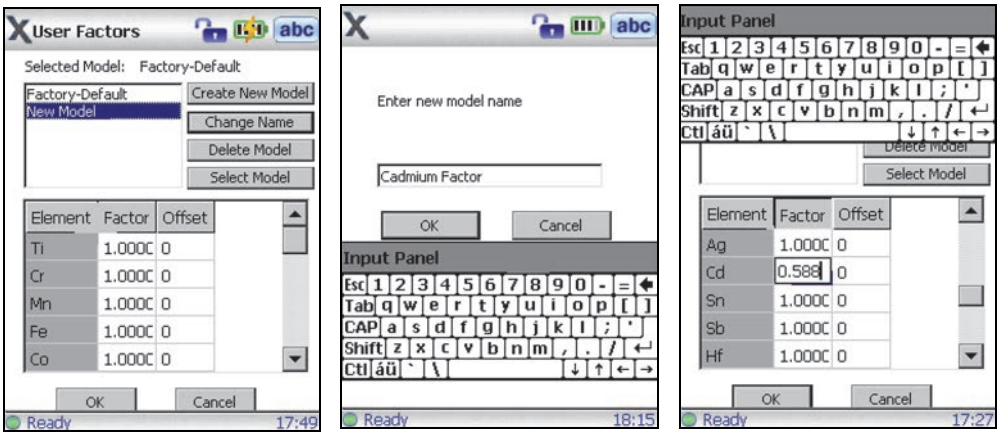


Figure E-3 Setting user factors

To apply user factor set model

- ◆ Highlight and select the model to apply to test results (see Figure E-4 on page 133).
  Selected model is displayed at the top of the screen and this user factor set is ready to be applied to XRF test results.

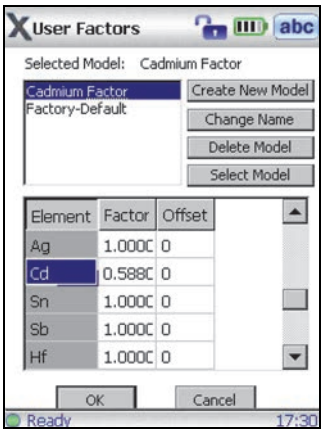


Figure E-4 Selecting user factor set model

E.6 Determining Correction Factors

Single Point Calibration

- Determine the ratio of XRF result to known value. Then divide the current factor by this ratio to determine the new element factor.

Multi-Point Calibration with No Offset

- The results are exported and plotted against known values using Excel or other data analysis software. A linear equation with slope and intercept (if necessary) is determined from the plot.

$$Y = mX$$

- XRF response is plotted on the X-axis and the assayed value plotted on the Y-axis. Factor = m if the original factor = –1.

Multi-Point Calibration with Offset

- The results are exported and plotted against known values using Excel or other data analysis software. A linear equation with slope and intercept is determined from the plot.

$$Y = mX + b$$

- Take initial data in the “factory-default” user factor set of factor = 1, offset = 0.
- XRF response is plotted on the X-axis and the assayed value plotted on the Y-axis. Factor = m and the offset = b.

Appendix F: RoHS/WEEE Analysis

F.1 Background

Toxic metals in consumer electronics are the focus of EU regulations that have worldwide ramifications. These new directives currently include:

- Restriction of Hazardous Substances (RoHS)
  - Designates maximum allowable levels of Pb, Cd, Cr^{6+}, Hg, and certain Br-containing flame retardants (PBB and PBDE) in new electrical and electronic equipment sold into the EU.
- Waste Electrical/Electronic Equipment (WEEE)
  - Requires separate collection and recycling of WEEE, some of which may contain hazardous substances.

The limits for RoHS elements are:

- <0. 1 % Pb, Cr^{6}+, Hg, Br (as flame retardants, PBB and PBDE)
- <0.01 % Cd
- Additionally, many other regulations and voluntary standards have been enacted worldwide that restrict elemental content in consumer products

The Olympus analyzer is a screening tool for RoHS Compliance. It is used to:

- Directly analyze the amount of toxic metals in electronics,
- Identify quickly whether a plastic is made of or contains:
  - PVC
  - A brominated flame retardant.

XRF measures *t*otal elemental composition, regardless of speciation of the element. Therefore, it reports:

- Total chromium including the concentration of hexavalent chromium plus any other forms of Cr.
- Total bromine, however XRF cannot distinguish the type of brominated flame retardant present in analyzed materials.

In order for XRF to be quantitative, samples must:

- Be homogeneous
- Match the matrix type of the calibration used (e.g. polymer, alloy, etc.)
- Have a certain minimum sample thickness
  - 5 mm for polymers and light alloys

— 15 mm for liquid samples
— 1 mm for other alloys

If samples are heterogeneous, too thin, or too small, only qualitative screening is possible.

The IEC-ACEA (International Electro-technical Commission — Advisory Committee on Environmental Aspects) and many regulatory bodies recommend XRF screening.

F.2 Software Overview

The DELTA handheld XRF analyzer in RoHS/WEEE mode automatically executes a test sequence to determine:

- Whether a sample is an alloy, polymer, or mixed sample.
  — *Mixed* indicates heterogeneous samples consisting of both polymer and alloy, such as wires or circuit boards.
- Whether each RoHS element passes, fails, or is inconclusive when compared to a set of stored criteria.
  — These criteria are either those recommended by the IEC, or ones added by the user.

The sequence begins with the instrument utilizing settings appropriate for analyzing a polymer sample. The following logic applies:

- If the sample is determined to be a polymer or mixed, the test continues, and a calibration based on a polymer matrix is used.
- If the sample is found to be a metal alloy, the analyzer switches to a secondary test, using an alloy matrix calibration, in order to determine correct alloy concentrations.

Sample Presentation

Since many pieces of plastic analyzed for RoHS/WEEE compliance are very small, take care to measure them in a safe and accurate manner. Refer to the IEC-ACEA recommendations for minimum thickness of test samples.

When minimum thickness cannot be met with a single sample, multiple identical samples can be stacked or layered to increase effective thickness. XRF sample cups (commonly used for soil testing) can be useful for testing many small samples together, such as surface mount components.

F.3 IEC Quantitative Screening Requirements

RoHS screening requirements are derived from the *Directive 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment* Dated 8 June 2011. This document is a recast of the original directive 2002/95/EC Dated 27 January 2003.

IEC Screening Guidelines below are adapted from an example screening scheme in IEC 62321 – *Electrotechnical products – Determination of levels of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)* Ed. 1.0, Dated December 2008.

CAUTION

Screening guidelines are given as an example scheme based on RoHS action levels. The inconclusive band around the action level is based on risk assessment, and is an example of an “uncertainty budget”.

Screening guidelines may vary based on sample types tested and user’s tolerance for risk. Following these screening guidelines alone may not be sufficient to ensure that a proper compliance determination is made.

Olympus strongly advises users to have their own compliance departments determine appropriate screening guidelines, test methodology, standard operating procedure, and the current status of the requirements that they must meet.

F.4 Grade Definitions for Screening

Table 11 Grade definitions

Grade	Proposed screening criteria
Pass	Results for ALL elements are lower than the lower limits shown (see Table 12 on page 138).
Fail	Result for ANY element higher than the higher limits shown (see Table 12 on page 138).
Inconclusive	Result of the quantitative analysis, for any of the elements Hg, Pb, or Cd, is in the region defined as intermediate, OR if the result of the elements BR and Cr is higher than the higher limits shown (see Table 12 on page 138), the analysis is inconclusive. Additional investigation must be performed.

F.5 Screening Limits for RoHS/WEEE Compliance

Table 12 Example of screening limits for RoHS elements

RoHS elements	Pass	Lower limit	Inconclusive	Upper limit	Fail
Cd	P	≤(70 – 3σ)	< X <	(130 + 3σ)≤	F
Pb	P	≤(700 – 3σ)	< X <	(1300 + 3σ)≤	F
Hg	P	≤(700 – 3σ)	< X <	(1300 + 3σ)≤	F
Br	P	≤(300 – 3σ)<	X		
Cr	P	≤(700 – 3σ)<	X		
Metallic materials					
Cd	P	≤(70 – 3σ)	< X <	(130 + 3σ)≤	F
Pb	P	≤(700 – 3σ)	< X <	(1300 + 3σ)≤	F
Hg	P	≤(700 – 3σ)	< X <	(1300 + 3σ)≤	F
Br			N/A		
Cr	P	≤(700 – 3σ)<	X		
Electronics					
Cd	P	LOD	< X <	(150 + 3σ)≤	F
Pb	P	≤(500 – 3σ)	< X <	(1500 + 3σ)≤	F
Hg	P	≤(500 – 3σ)	< X <	(1500 + 3σ)≤	F
Br	P	≤(250 – 3σ)<	X		
Cr	P	≤(500 – 3σ)<	X		

Appendix G: Test Time Notes

G.1 Background

Test times for DELTA handheld XRF analyzers are a function of several items, including:

- User chosen mode
- Desired precision
- Desired result speed or throughput time (a trade-off with precision)

Other technical design factors can include:

- X-ray producing hardware/electronics including type of detector.
- Software and processor sophistication

A key difference for DELTA instrument models is the type of detector

- Classic and Classic Plus — PIN diode
- Standard, Professional, Premium, and Premium Plus — Silicon Drift Detector (SDD)

SDD-based units have much faster processing response times as compared to the PIN units.

G.2 Testing Time Issues — All Modes

- *Min. testing time* is the interval that must elapse before results are calculated.
  - — Results do not appear until the min. testing time has elapsed.
- If a test is stopped before the min. testing time has elapsed, the test is aborted.
  - — No results are calculated.
  - — No information related to the test is saved.
- *Max. testing time* automatically ends the test at a preset testing interval.
  - — It may be two minutes (or more) depending on detection limits and desired precision.

Alloy Comments

For most alloys, to obtain a unique grade ID and good alloy chemistry, the recommended testing time is 5 to 10 seconds.

For some alloys that only differ by small amounts of one or two elements, it may be necessary to perform longer tests. Examples include low alloy steels 4140 and 4340, and aluminum alloys 6063 and 1100.

In Alloy mode, for separation of alloys which differ by less than 1 % of Ti or V, QuickSort is recommended as the SmartBeam option.

In Alloy Plus mode, for separation of alloys which differ by presence or concentration of light elements, SmartSort is recommended as the Alloy Plus option.

The maximum testing time determines the length of a test. The analysis automatically stops if the maximum testing time is reached. Normal maximum testing times range from 5 to 20 seconds, though longer times may be needed for beam 2 of Alloy Plus mode.

G.3 Alloy Analysis Goals

Use shorter analysis times if goal is primarily grade identification.

Use longer test times if greater precision is required in the calculation of chemistry or if an alloy separation is particularly difficult.

Appendix H: Alloy Grade Libraries

Every DELTA handheld XRF analyzer is supplied with four libraries:

- The Factory library unique to every model (see the following pages for tables showing model/factory grade names).
- The Tramp library.
- User library #1 (the user can store over 500 grade names).
- User library #2 (the user can store over 500 grade names).

NOTE

Libraries are editable. However, Olympus does not recommend that users edit the Factory Grade library.

H.1 Tramp Library

Every analyzer is shipped with a Tramp library comprised of seven base alloys (see Table 13 on page 142). The Tramp library supports other grade libraries.

Tramp limits can be set, element by element, alloy base by alloy base, to meet specific requirements.

A single click can globally select/deselect the Tramp features.

How the Tramp library works

1. Tramp grades are matched to alloy bases rather than specific grades.
   - Each sample is determined to be one of seven possible base alloys (see Table 13 on page 142).
   - The analyzer applies the Tramp grade/base-specific tramp limits from the matching Tramp grade.
2. These Tramp or "alloy-base-specific" limits are applied when an element is detected in a specific grade, and:
   - The nearest grade match has no specification for that element.
   - The concentration of the sample is less than the max limit specified by the matching Tramp grade.
3. Once the conditions for step 2 are met, the element reported on the user interface screen:
   - Is displayed in blue.
   - Is labeled as a Tramp material in the grade comparison table.

- The grade match, however, is not penalized.

Practical Advantages of the Tramp Element Approach

- Faster sorting
- Fewer ambiguous or incorrect matches
- Improved grade library integrity
- Prominent labeling of tramp elements

Table 13 Tramp library base alloys

Base alloys	Common Tramp elements
_AlAlloyBase	Pb, Bi, Sn, Fe, Cu, and Zn.
_CoAlloyBase	Al, Ti, V, Cu, Nb, Ta, and Zr.
_CuAlloyBase	S, As, Ag, Sb, and Sn; not as common Pb, Co, and Ni.
_FeAlloyBase	V, Co, Cu, Ni, and As; sometimes Si, W, and Nb.
_GenericAlloyBase	V, Co, Cu, Ni, and As; sometimes Si, W, and Nb.
_NiAlloyBase	V, Co, W, Zr, and Nb; sometimes Ta, Mo, Cr, and Cu.
_TiAlloyBase	Fe is common; Cu and Si show up at low levels.

H.2 DELTA Classic, Classic Plus, and Inspector Factory Grade Library

Table 14 Aluminum, cobalt alloys, and speciality grades

Aluminum	Cobalt alloys	Speciality grades
2007	Alloy 686	60Sn-40Pb
2011	AlnicoVIII	63Sn-37Pb
2018	Cobalt	96-4
2117	Elgiloy	AZ31B
2618	F75	AZ91A or C
4032	FSX-414	SAC 300
5454	Haynes188	SAC 305
6040	Haynes36	SAC 400
6061	HS-1	SAC 405
6070	HS-12	97-3
6253	HS-19	Ag
6262	HS-21	Au

Table 14 Aluminum, cobalt alloys, and speciality grades *(continued)*

Aluminum	Cobalt alloys	Speciality grades
7005	HS-25-L605	Bi
7016	HS-31	Cb 103
7019	HS-4	CP Ta
7039	HS-6B	Cr
7050	Jetalloy	Densalloy
7072	MarM302	Hf
7075	MarM509	Mn
7104	MarM905	Mo
1100-plus	MP35N	Nb
2024-plus	MPN159	Ni
2098-2195	Star J	Pb
2219-2519	Ultimet	Pd
3003 or 4 or 5		Re
355-2		Sb
5052-plus		Se
5086-plus		Sn
6063-plus		TungCarb C
7049-149-249		TungCarb S
		V
		W
		Zn
		Zr
		Zr 2 or 4
		Zr 702
		Zr 704
		Zr 705

Table 15 Copper and nickel alloys

Copper alloys			Nickel alloys		
C 110	C 510	C 864	B 1900	I-617	MarM421
C 172	C 524	C 867	B-1900 Hf	I-625	Monel400
C 194	C 534	C 868	C-1023	I-690	Monel411
C 210	C 544	C 875	GMR235	I-700	MonelK500
C 220	C 623	C 8932	GTD222	I-702	MuMetal
C 260	C 630	C 903	Hast BC1	I-706	Ni 200
C 270	C 655	C 922	HastB	I-713	NichromeV
C 310	C 667	C 932	HastB2	I-718	Nim101
C 314	C 673	C 937	HastB3	I-720	Nim263
C 330	C 675	C 955	HastC2000	I-722	Nimonic75
C 332	C 706	C194HiCu	HastC22	I-725	Nimonic80A
C 340	C 710	C197HiCu	HastC276	I-738	Nimonic90
C 342	C 715	Elec Cu	HastC4	I-750	PWA1480
C 360	C 745	Muntz	HastF	I-792	PWA1484
C 377	C 752	NarloyZ	HastG	I-800	RA333
C 425	C 814	SeBiLOYI	HastG2	I-801	Rene125
C 443	C 836	SeBiLOYII	HastG3	I-825	Rene142
C 464	C 857	SeBiLOYIII	HastG30	I-901	Rene220
C 482			HastN	I-903	Rene41
C 485			HastR	I-907-909	Rene77
			HastS	I-939	Rene80
			HastW	IN100Mar	Rene95
			HastX	M002	Supertherm
			Haynes230	MarM200	Udimet500
			HR160	MarM246	Udimet520
			HyMu80	MarM247	Udimet700
			I-102I-49		Waspaloy
			I-600		
			I-601		

Table 16 Low-alloy and chrome-moly steels

Low-alloy steels	Chrome-moly steels
3310	1 1-4 Cr
4130	2 1-4 Cr
4140	5 Cr
4340	9 Cr
8620	P91
9310	
12L14	
A10	
Carb 1-2 Moly	
Carbon Steel	
20Mo4	

Table 17 Stainless, Ti, and Tool steels

Stainless grades			Ti grades	Tool steels
201	21-6-9	Haynes556	Cp Ti	A2
203	25-4-4	Incoloy840	Cp Ti Pd	A6
304	254SMO	Invar 36	Ti 12	A7
309	26-1	Kovar	Ti 17	D2 or D4
310	29-4	M152	Ti 3 2-5	D7
316	29-4-2	Maraging350	Ti 6-22-22	H-11
317	29-4C	MaragingC200	Ti 6-2-4-2	M1
321	302HQ	MaragingC250	Ti 6-2-4-6	M2
329	410 Cb	MaragingC300	Ti 6-4	M4
330	410-16-20	N-155	Ti 6-6-2	M42
347	904L	Ni-hard#1	Ti 8	O1
422	A-286	Ni-hard#4	Ti 8-1-1	O2
430	AL6XN	Ni-Span902	Ti 10-2-3	O6
431	Alloy42	Nitronic40	Ti 15-3-3-3	S1
434	AlnicoII	Nitronic50	Ti 3-11-13	S5
440	AlnicoIII	Nitronic60	Ti 5 - 2-5	S6

Table 17 Stainless, Ti, and Tool steels *(continued)*

Stainless grades			Ti grades	Tool steels
441	AlnicoV	RA330	Ti 6-2-1-1	S7
446	AMS350	RA85H	TiBetaC	T1
2003	AMS355	Zeron100		
2101	CD4MCU			
2507	Custom450			
13-8 Mo	Custom455			
15-5 PH	Duplex2205			
15Mn7Cr	E-bite			
17-4 PH	Ferallium255			
17-7 PH	GreekAscoloy			
19-9DL	H12			
19-9DX	H13			
20Cb3				
20Mo6				

H.3 DELTA Standard and Professional Factory Grade Library

Table 18 Aluminum, cobalt alloys, and speciality grades

Aluminum	Cobalt alloys	Speciality grades
319	Alloy 686	60Sn-40Pb
333	AlnicoVIII	63Sn-37Pb
380	Cobalt	96-4
383	Elgiloy	AZ31B
384	F75	AZ91A or C
2007	FSX-414	SAC 300
2011	Haynes188	SAC 305
2018	Haynes36	SAC 400
2024	HS-1	SAC 405
2117	HS-12	97-3
2618	HS-19	Ag
3004	HS-21	Au

Table 18 Aluminum, cobalt alloys, and speciality grades *(continued)*

Aluminum	Cobalt alloys	Speciality grades
4032	HS25-L605	Bi
5042	HS-31	Cb 103
5052	HS-4	CP Ta
5083	HS-6B	Cr
5086	Jetalloy	Densalloy
5154	MarM302	Hf
5454	MarM509	Mn
6040	MarM905	Mo
6061	MP35N	Nb
6070	MPN159	Ni
6253	Star J	Pb
6262	Ultimet	Pd
7005		Re
7016		Sb
7019		Se
7039		Sn
7050		TungCarb C
7072		TungCarb S
7075		V
7104		W
1100-plus		Zn
2014-17 std		Zr
2024-plus		Zr 2 or 4
2098-2195		Zr 702
2219-2519		Zr 704
3003 or 4 or 5		Zr 705
3003 or 5		
355-2		
356-57-std		
5052-plus		

Table 18 Aluminum, cobalt alloys, and speciality grades *(continued)*

Aluminum	Cobalt alloys	Speciality grades
5056-82		
5086-plus		
6063-plus		
7049-149-249		

Table 19 Copper and nickel alloys

Copper alloys			Nickel alloys		
C 110	C 510	C 864	20Mo4	I-102	MarM247
C 172	C 524	C 867	B 1900	I-49	MarM421
C 194	C 534	C 868	B-1900 Hf	I-600	Monel400
C 210	C 544	C 875	C-1023	I-601	Monel411
C 220	C 623	C 8932	Colmonoy 6	I-602	MonelK500
C 260	C 630	C 903	GMR235	I-617	MuMetal
C 270	C 655	C 922	GTD222	I-625	Ni 200
C 310	C 667	C 932	Hast BC1	I-690	NichromeV
C 314	C 673	C 937	HastB	I-700	Nim101
C 330	C 675	C 955	HastB2	I-702	Nim263
C 332	C 706	C194HiCu	HastB3	I-706	Nimonic75
C 340	C 710	C197HiCu	HastC2000	I-713	Nimonic80A
C 342	C 715	Elec Cu	HastC22	I-718	Nimonic90
C 360	C 745	Muntz	HastC276	I-720	PWA1480
C 377	C 752	NarloyZ	HastC4	I-722	PWA1484
C 425	C 814	SeBiLOYI	HastF	I-725	RA333
C 443	C 836	SeBiLOYII	HastG	I-738	Rene125
C 464	C 857	SeBiLOYIII	HastG2	I-750	Rene142
C 482			HastG3	I-792	Rene220
C 485			HastG30	I-800	Rene41
			HastN	I-801	Rene77
			HastR	I-825	Rene80
			HastS	I-901	Rene95
			HastW	I-903	Supertherm

Table 19 Copper and nickel alloys *(continued)*

Copper alloys			Nickel alloys		
			HastX	I-907-909	Udimet500
			Haynes214	I-939	Udimet520
			Haynes230	IN100	Udimet700
			HR160	MarM002	Waspaloy
			HyMu80	MarM200	
				MarM246	

Table 20 Low-alloy and chrome-moly steels

Low-alloy steels	Chrome-moly steels
3310	1 1-4 Cr
4130	2 1-4 Cr
4140	5 Cr
4340	9 Cr
8620	P91
9310	
12L14	
A10	
Carb 1-2 Moly	
Carbon Steel	
P20	
135 N	

Table 21 Stainless, Ti, and Tool steels

Stainless grades			Ti grades	Tool steels
201	17-7 PH	H12	Cp Ti	A2
203	19-9DL	H13	Cp Ti Pd	A6
303	19-9DX	Haynes556	Ti 12	A7
304	20Cb3	Incoloy840	Ti 17	D2 or D4
309	20Mo6	Invar 36	Ti 3 2-5	D7
310	21-6-9	Kovar	Ti 6-22-22	H-11
316	25-4-4	M152	Ti 6-2-4-2	M1

Table 21 Stainless, Ti, and Tool steels *(continued)*

Stainless grades			Ti grades	Tool steels
317	254SMO	Maraging350	Ti 6-2-4-6	M2
321	26-1	MaragingC200	Ti 6-4	M4
329	29-4	MaragingC250	Ti 6-6-2	M42
330	29-4-2	MaragingC300	Ti 8	O1
347	29-4C	N-155	Ti 8-1-1	O2
410	302HQ	Ni-hard#1	Ti 10-2-3	O6
416	410 Cb	Ni-hard#4	Ti 15-3-3-3	S1
420	410-16-20	Ni-Span902	Ti 3-11-13	S5
422	904L	Nitronic40	Ti 5 - 2-5	S6
430	A-286	Nitronic50	Ti 6-2-1-1	S7
431	AL6XN	Nitronic60	TiBetaC	T1
434	Alloy42	RA330		
440	AlnicoII	RA85H		
441	AlnicoIII	Zeron100		
446	AlnicoV			
2003	AMS350			
2101	AMS355			
2205	CD4MCU			
2205	Custom450			
2507	Custom455			
13-8 Mo	E-bite			
15-5 PH	Ferallium255			
15Mn7Cr	GreekAscoloy			

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Table 22 Aluminums, cobalt alloys, and speciality grades

Aluminums	Cobalt alloys	Speciality grades
319	Alloy 686	60Sn-40Pb
333	AlnicoVIII	63Sn-37Pb
356	Cobalt	96-4

Table 22 Aluminums, cobalt alloys, and speciality grades *(continued)*

Aluminums	Cobalt alloys	Speciality grades
357	Elgiloy	AZ31B
380	F75	AZ91A or C
383	FSX-414	SAC 300
384	Haynes188	SAC 305
1100	Haynes36	SAC 400
2007	HS-1	SAC 405
2011	HS-12	97-3
2018	HS-19	Ag
2024	HS-21	Au
2117	HS25-L605	Bi
2618	HS-31	Cb 103
3002	HS-4	CP Ta
3003	HS-6B	Cr
3004	Jetalloy	Densalloy
3005	MarM302	Hf
3105	MarM509	Mn
4032	MarM905	Mo
5005	MP35N	Nb
5042	MPN159	Ni
5052	Star J	Pb
5083	Ultimet	Pd
5086		Re
5154		Sb
5454		Se
5657		Sn
6040		TungCarb C
6061		TungCarb S
6063		V
6070		W
6253		Zn

Table 22 Aluminums, cobalt alloys, and speciality grades *(continued)*

Aluminums	Cobalt alloys	Speciality grades
6262		Zr
7005		Zr 2 or 4
7016		Zr 702
7019		Zr 704
7039		Zr 705
7050		
7072		
7075		
7104		
1100-plus		
2014-17		
2024-plus		
2098-2195		
2219-2519		
3003 or 4 or 5		
355-2		
5052-plus		
5056-82		
5086-plus		
6063-plus		
7049-149-249		

Table 23 Copper and nickel alloys

Copper alloys			Nickel alloys		
C 110	C 510	C863	20Mo4	I-102	MarM246
C 172	C 524	C 864	B 1900	I-49	MarM247
C 194	C 534	C 867	B-1900 Hf	I-600	MarM421
C 210	C 544	C 868	C-1023	I-601	Monel400
C 220	C 623	C 875	Colmonoy 6	I-602	Monel411
C 240	C 630	C 8932	GMR235	I-617	MonelK500
C 260	C642	C 903	GTD222	I-625	MuMetal

Table 23 Copper and nickel alloys *(continued)*

Copper alloys			Nickel alloys		
C 270	C 655	C 922	Hast BC1	I-690	Ni 200
C 310	C 667	C 932	HastB	I-700	NichromeV
C 314	C 673	C 937	HastB2	I-702	Nim101
C 330	C 675	C 954	HastB3	I-706	Nim263
C 332	C 687	C 955	HastC2000	I-713	Nimonic75
C 340	C 706	C194HiCu	HastC22	I-718	Nimonic80A
C 342	C 710	C197HiCu	HastC276	I-720	Nimonic90
C 360	C 715	Elec Cu	HastC4	I-722	PWA1480
C 377	C 745	Muntz	HastF	I-725	PWA1484
C 425	C 752	NarloyZ	HastG	I-738	RA333
C 443	C 814	SeBiLOYI	HastG2	I-750	Rene125
C 464	C 836	SeBiLOYII	HastG3	I-792	Rene142
C 482	C 857	SeBiLOYIII	HastG30	I-800	Rene220
C 485	C 861		HastN	I-801	Rene41
			HastR	I-825	Rene77
			HastS	I-901	Rene80
			HastW	I-903	Rene95
			HastX	I-907-909	Supertherm
			Haynes214	I-939	Udimet500
			Haynes230	IN100	Udimet520
			HR160	MarM002	Udimet700
			HyMu80	MarM200	Waspaloy

Table 24 Low-alloy and chrome-moly steels

Low-alloy steels	Chrome-moly steels
3310	1 1-4 Cr
4130	2 1-4 Cr
4140	5 Cr
4340	9 Cr
8620	P91
9310	

Table 24 Low-alloy and chrome-moly steels *(continued)*

Low-alloy steels	Chrome-moly steels
12L14	
A10	
Carb 1-2 Moly	
Carbon Steel	
P20	
135 N	

Table 25 Stainless, Ti, and Tool steels

Stainless grades			Ti grades	Tool steels
201	17-4 PH	H12	Cp Ti	A2
203	17-7 PH	H13	Cp Ti Pd	A6
303	19-9DL	Haynes556	Ti 12	A7
304	19-9DX	Incoloy840	Ti 17	D2 or D4
309	20Cb3	Invar 36	Ti 3 2-5	D7
310	20Mo6	Kovar	Ti 6-22-22	H-11
316	21-6-9	M152	Ti 6-2-4-2	M1
317	25-4-4	Maraging350	Ti 6-2-4-6	M2
321	254SMO	MaragingC200	Ti 6-4	M4
329	26-1	MaragingC250	Ti 6-6-2	M42
330	29-4	MaragingC300	Ti 8	O1
347	29-4-2	N-155	Ti 8-1-1	O2
410	29-4C	Ni-hard#1	Ti 10-2-3	O6
416	302HQ	Ni-hard#4	Ti 15-3-3-3	O7
420	410 Cb	Ni-Span902	Ti 3-11-13	S1
422	410-16-20	Nitronic40	Ti 5-2-5	S5
430	904L	Nitronic50	Ti 6-2-1-1	S6
431	A-286	Nitronic60	TiBetaC	S7
434	AL6XN	RA330		T1
440	Alloy42	RA85H		
441	AlnicoII	Zeron100		
446	AlnicoIII			

Table 25 Stainless, Ti, and Tool steels *(continued)*

Stainless grades			Ti grades	Tool steels
2003	AlnicoV			
2101	AMS350			
2205	AMS355			
2205	CD4MCU			
2507	Custom450			
13-8 Mo	Custom455			
15-5 PH	E-bite			
15Mn7Cr	Ferallium255			
	GreekAscoloy			

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